EVALUATION OF POSTOPERATIVE PYREXIA IN THE GENERAL SURGICAL WARD

Dissertation Submitted in partial fulfillment of the Regulations for the award of degree of

M.S. BRANCH – I
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CHENNAI.

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CERTIFICATE

This is to certify that the dissertation entitled **"Evaluation of postoperative pyrexia in the general surgical ward"** is a bonafide work done by Dr.G. Selvamuthu Kumaran at Stanley Medical College, Chennai in partial fulfillment of the university rules and regulations for the award of M.S., Branch I General Surgery under my guidance and supervision during the academic year 2008-2011.

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I, Dr.G.Selvamuthukumar, Solemnly declare that this dissertation title **"EVALUATION OF POSTOPERATIVE PYREXIA IN THE GENERAL SURGICAL WARD"** is a bonafide work done by me at Govt. Stanley Medical College from May 2008 to October 2010 under the guidance and supervision of my Unit chief.

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Place : Chennai

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INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-3

Title of the Work : Evaluation of Post-Operative Pyrexia in the General Surgical ward

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The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 15.04.2010 at the Modernised Seminar Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

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CONTENTS

Introduction

INTRODUCTION

The term Fever or Pyrexia is considered to be a highly conserved adaptive response that infers a survival advantage to the host. Fever is a common among postoperative patients, so much so that "Postoperative Pyrexia" is a recognize d term in the literature despite the fact that the syndrome has not been well characterized. It is one of the most common problems seen by both surgeons and Medical Consultants. Most cases of fever that immediately follow surgery are self limiting, but it is critical not to miss more serious etiologies (James C. Pile 2006).

When evaluating postoperative pyrexia, it is important to recognize when a Wait and Watch approach is appropriate, when further work up is needed and when immediate action is indicated.

It is often difficult to determine whether an elevation in body temperature is a normal physiologic response or an indicator of significant underlying pathology. Often, the specific cause of fever is not found despite rigorous efforts to identify a cause.

The following study evaluates the incidence of post operative pyrexia in the general surgical ward and correlates the fever to the postoperative day on which it occurs. The effectiveness of simple

measures like wound washing and segmular drains in preventing wound infection and thereby pyrexia has also been studied.

This study has been conducted on patients admitted and treated in Government Stanley Medical College and Hospital during the period between May 2008 to October 2010.

A im of the Study

AIM OF THE STUDY

1. To study the common causes of origin of postoperative pyrexia in the general surgical ward.

2. To evaluate the patients with post operative pyrexia.

3. To study the correlation between the cause and the day of onset of pyrexia.

4. To study the risk factors associated with post operative pyrexia.

5. To analyze the treatment and remedial measures.

6. To identify and define the various challenges for the surgeon due to pyrexia.

7. To study the effectiveness of simple techniques like wound washing and the role of segmular drainage tubes in promoting wound healing and thereby reducing the incidence of fever.

Review of Literature

REVIEW OF LITERATURE

The definition of fever is arbitrary and depends on the purpose for which it is defined. Some literatures define fever as a core temperature more than 38°C(100.4°F) (Bone RC et al 1992), where as other sources define fever as two consecutive elevations >38.3°C (101°F). Since there is considerable variability in "Normal Temperature" for a population of operated patients and since the site and method of measurement can influence the recorded number, a variety of arbitrary definitions of fever are acceptable. The lower the temperature that is used to define fever, the more sensitive the indicator is for detecting an infectious process, but the less specific the indicator will be.

Normal body temperature is generally considered to be 37°C (98.6°F). In healthy individuals, this temperature varies by 0.5° to l°C according to circadian, rhythm and menstrual cycle (Dinarello et al 1988).

In the post operative period, a wide range of biological processes, some infectious and many non-infectious can cause temperature elevation. Some of the non-infectious etiologies can be as life threatening as an infection. Thus, infection is not the only type of process causing temperature elevation that needs immediate action.

In some post operative patients, the temperature elevation is so predictable that such elevations should not necessarily trigger a laboratory and radiological evaluation for infection unless specific symptoms and signs suggest that the expected cause of fever is not the etiology. This situation requires careful patient assessment, experience with a given patient population and clinical judgement.

Conversely, a substantial proportion of infected patients are not febrile; such patients may be euthermic or hypothermia. These include the elderly patients with open abdominal wounds, patients on drugs like antipyretics. These patients may in fact have a life threatening infection. Other symptoms and signs, such as unexplained hypotension, tachycardia, tachypnoea, confusion, rigors, skin lesion, oliguria, leukocytosis or leukopenia might appropriately mandate a comprehensive search for infection and aggressive, immediate therapy.

MEASUREMENT OF BODY TEMPERATURE

There are 2 different types of temperature measurements:

1) Core temperature or central temperature.

2) Peripheral temperature.

The core temperature is constant whereas the peripheral temperature is variable. Temperature has traditionally been measured orally, rectally, centrally (by intravascular thermistor) and in the axilla.

The ideal system for measuring temperature should provide reliable, reproducible values safely and conveniently. Any device must be calibrated properly and checked periodically according to the manufacturer's specification. Most authorities consider the thermistor of a pulmonary artery catheter to be the standard for measuring core temperature against which other devices must be compared (Milewski A et al 1991), Not all patients have such a thermistor in place.

Rectal temperatures obtained with a mercury thermometer or an electronic probe (intermittent or continuous) are traditional measurement devices (Eichna LW et al 1951).

Oral temperature measurement is safe, convenient, and familiar for alert and cooperative patients. Mouth breathing, heated gases and hot or cold fluids can distort the reading (Cranston WI et al 1954). In critically ill post surgical patients, oral temperatures are often not practical due to intubation or inability of patient to cooperate.

Tympanic membrane temperature is believed to reflect the temperature of the hypothalamus and thus the core body temperature.

Direct measurement of Tympanic membrane temperature requires electronic probes and risks trauma to the tympanic membrane. Infra red ear thermometry is also available to detect radiant energy from the tympanic membrane and ear canal through an otoscopic probe (Erickson RS et al 1994). The temperature measurement in the Axilla should be discouraged because of its unreliable correlation with core temperature and poor reproducibility.

REGULATION OF BODY TEMPERATURE

The body temperature is regulated by the hypothalamus. There are two main centers in the hypothalamus, which are concerned with temperature regulation namely:

A. Heat loss center located in the preoptic nucleus of the anterior hypothalamus which increases the rate of secretion of sweat and reduces the heat production by inhibiting shivering and metabolic reactions.

B. Heat gain center located in the posterior hypothalamus which activates the sympathetic system and causes vasoconstriction. It also induces shivering and accelerates cellular metabolic activities (Guyton and Hall 2001).

CONCEPT OF “SET POINT” FOR TEMPERATURE CONTROL

At a particular level of core body temperature (37.1deg.C), drastic changes occur in the rates of both heat loss and heat production. At temperatures above this level, the rate of heat loss is more than the rate of production and vice versa. This crucial temperature level is called the “hypothalamic set point” of the temperature control mechanism. This set point changes with different disease conditions. All the temperature control mechanisms always try to bring the body temperature back to the set point level for the particular disease state.

PATHOPHYSIOLOGY OF POST OPERATIVE PYREXIA

Pyrexia in the post operative period is produced by pyrogens or pyrogenic cytokines released either from bacteria or from damaged tissues.

Effect of Pyrogens of bacterial origin

Many proteins, breakdown products of proteins and certain other substances, especially Lipopolysaccharides and toxins released from bacterial cell membranes can cause the set point of the hypothalamic thermostat to rise and substances that cause this effect are called as “pyrogens”. When the set point of the hypothalamic temperature

regulating centre becomes increased to a higher level than normal, all the mechanisms for raising the body temperature to this higher level are brought into play, including heat conservation and increased heat production (shivering). So, within a few hours after the set point has been increased to a higher level, the body temperature also approaches this level (Guyton and Hall 2001).

Effect of tissue damage during surgery

The tissue trauma associated with surgery, elicits the production of pyrogenic cytokines in the absence of infection. The production of endogenous pyrogens or pyrogenic cytokines, is the final common pathway through which fever occurs in the absence of infection

Mechanism of action of these pyrogens in causing fever - Role of IL-1 (Guyton and Hall 2001).

Experiments in animals have shown that some pyrogens can act directly and immediately on the hypothalamic temperature regulating centre to increase its set point. Other pyrogens function indirectly and may require several hours of latency before causing their effects. This is true of many of the bacterial pyrogens, especially the endotoxins, from gram negative bacteria, which are phagocytosed by blood leukocytes and tissue macrophages and by large granular killer lymphocytes. These

are digested and the IL-1 or leukocyte pyrogen or endogenous pyrogen is released into the circulation, which on reaching the hypothalamus, activates the process to produce fever.

Several experiments have suggested that IL-1 causes fever by first inducing the formation of one of the prostaglandins, mainly PGE2 which acts on the hypothalamus and elicits the fever reaction. When the formation of PGE2 is blocked by drugs, the fever is either completely aborted or at least reduced.

ETIOLOGY OF POST OPERATIVE PYREXIA

One of the most concerning clinical findings in a patient postoperatively is the development of a persistent fever. A Host of Infectious and non-Infectious agents may cause a post operative fever and although most of them do not represent serious threats to the patient, those that do must be sought out and managed. It is important not to overlook the non-Infectious causes when a fever is present, as the cause may be quite benign, or may be indicative of a serious underlying process. The cause of fever in the post operative period may be conveniently classified as under (Christopher Sikora et al 2003).

INFECTIOUS

Related to Surgery	Not Related to Surgery
Wound Infection	Pneumonia
Intra Abdominal Abscess	Urinary Tract Infection
Peritonitis	Clostridium difficile enterocolitis
Infected Prosthesis (Mesh)	Pharyngitis/Sinusitis
Transfusion Related	Decubitus ulcers
Bacteremia	Hepatitis
Retained foreign body	

NON- INFECTIOUS

Atelectasis	Myocardial Infarction
Medications (Anaesthetics and others)	Thyro toxicosis
Thrombophlebitis	Allergic Reaction
Adrenal Insufficiency	Sub Arachnoid Bleed
Drug Fever	Transfusion Reaction
Malignancy	Withdrawal Syndromes
Pulmonary Embolus	Deep Vein Thrombosis

In vast majority of studies, the incidence of infection in patients with postoperative fever is less than 10%, indicating that fever is not a specific marker of infection (James C. Pile et al 2006).

Fanning et al 1998, in a retrospective review of 537 patients who underwent gynaecological surgery, found that 211 (30%) developed postoperative pyrexia, but no infectious etiology was found in 92% of cases.

Shaw and Chung et al 1999, in a retrospective review of 200 patients undergoing total hip replacement or knee Arthroplasty, reported that "Virtually All" had elevated temperatures postoperatively but none had documented infection.

Evaluation of Patients with fever postoperatively usually involves studying the five "Ws" (Christopher Sikora et al 2004). They include:

Wind

In the first 24 hours after operation, 27% to 58% of patients may develop fever. Most of these cases are due to Alelectasis. It is of little concern unless associated with systemic signs, such as rigors, altered sensorium or hypotension. Pneumonia may occur several days post-surgery and is an important diagnosis to consider if systemic signs are

present. It is also important to question the presence of a ventilator-associated pneumonia after prolonged intubation.

Water

Patients who are on prolonged urethral catheter are at an increased risk of developing cystitis and urinary infection. The catheter should be removed as soon as the patient is able to mobilize, to use a urinal.

Wound

It is important not to miss something notorious, like a necrotizing fascitis or an intestinal leak, especially post-surgery. Cellulitis may be present in the early stages and an abscess may evolve later. In late stages, prosthetic material may be infected and present itself as fever. Leaking anastamosis, from gastrointestinal procedures may also be present later on.

Veins/ Wings

Veins, extremities, and all vascular access sites should be inspected for the presence of thrombophlebitis. Likewise, it is important to consider a deep vein thrombosis in a patient who has immobilized, or has another reason to be in a hypercoagulable state.

Wonder drugs

It is worthwhile to consider the patient's previous medications, as well as those received intraoperatively. Any transfusion products or anti inflammatory agents can be included in this category.

RISK FACTORS PREDISPOSING TO THE DEVELOPMENT OF POST OPERATIVE PYREXTA

A. PATIENT FACTORS

1. **Age** : Wound Infection is common at extremes of age due to abnormal immune system.
2. **Nutrition** : Lack of specific nutrients like vitamins and trace metals affects would healing and predisposes to complications.
3. **Anaemia** : One of the most common causes of delayed wound healing.
4. **Systemic Disease** : Diabetes, IHD, Hypertension, Jaundice, Uremia, Malignancy.
5. **Foci of Sepsis** : Skin Lesions, Dental Caries, Poor local hygiene.
6. **Drugs**
7. **Obsesity**

B. SURGEON FACTORS

1. Preoperative

This includes Patient Selection, Patient Preparation, Prophylactic Antibiotics.

2. Operative

This includes Anaesthetic complications, Operative Technique and tissue handling, Use of tissue reactive suture materials, Gossipyboma? and retained instruments.

3. Post Operative

This includes Wound care, Early patient mobilization, Fluid and cardiovascular monitoring, Breathing exercises, Recognition of complications of surgery.

C. HOSPITAL/THEATRE FACTORS

This includes Sterility of operating rooms, Supply of sterile instruments/dressings, Nursing staff, Treatment protocols, Hospital policies and guidelines.

EVALUATION OF POST OPERATIVE PYREXIA BASED ON THE DAY OF ONSET OF FEVER:

Fever is a common phenomenon during the initial 48 hours following surgery. Evaluation of the febrile patient in the post operative ward requires a meticulous and thoughtful approach to ensure that the cause of fever is accurately identified and appropriately treated.

PYREXIA ON DAYS 0-2

1. Tissue Damage, Necrosis and Hematoma

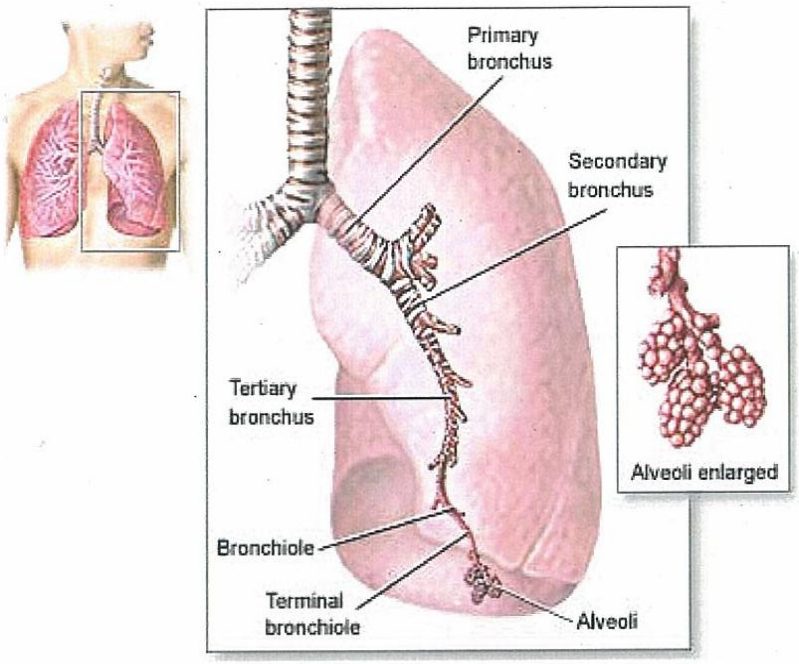
The release of pyrogenic cytokines like IL-I is associated with the onset of a mild pyrexia on days 1 and 2 in the post operative period.

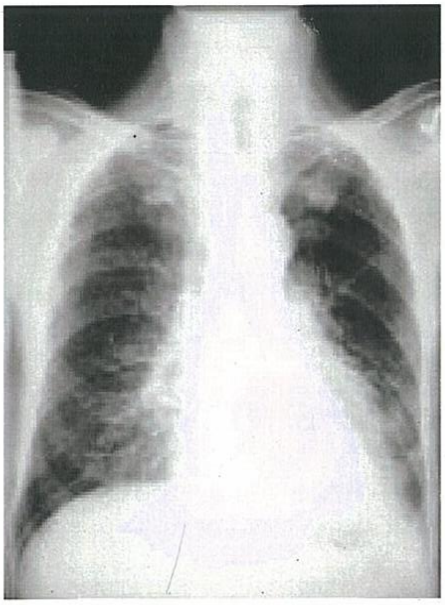
2. Post Operative Atelectasis

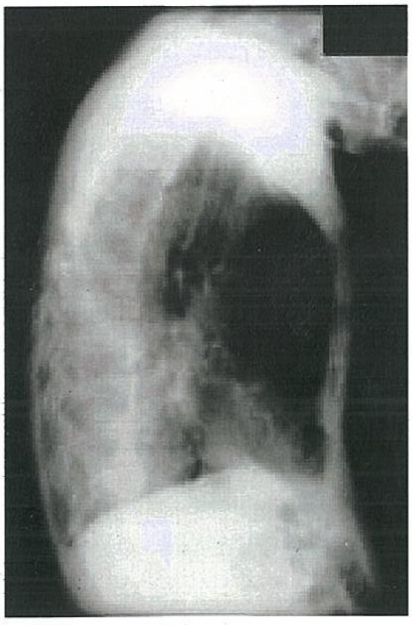
Generally occurs within 48 hours of surgery. It is an extremely common post operative complication with some degree of pulmonary collapse occurring after almost every abdominal or transthoracic procedure.

The mucous secreted by the respiratory epithelium is retained in the bronchial tree, blocking the finer bronchi, the alveolar air is then reabsorbed with collapse of the supplied lung segments, usually the

ATELECTASIS IN THE POSTOPERATIVE PERIOD.







CHEST X-RAY (AP AND LATERAL VIEWS) OF A 30 YEAR OLD WITH ATELECTASIS LEFT LOBE. LOSS OF LUNG VOLUME LEFT SIDE, ELEVATED LEFT HEMI DIAPHRAGM, OPACITY BEHIND THE HEART – SAIL SIGN.

basal lobes. The collapsed lung may become secondarily infected by inhaled organisms.

Predisposing factors include Obesity, Smoking, Wound Pain(Upper abdominal/thoracic) incisions, Opiates and drowsiness, Pregnancy, Muscular weakness, Nasogastric tube insertion, Abdominal distension

The **ETIOLOGY** can be considered as follows:

Pre operative factors

- Pre existing acute or chronic chest infection increase bronchial secretion and involve pathogenic bacteria.
- Heavy smokers are at particular risk.
- Emphysema, ankylosing spondylitis and other conditions which make coughing difficult in the post operative period predispose to mucus retention.

Operative factors

- Irritant anaesthetic drugs, which increase secretion and depress the action of the bronchial cilia.
- Atropine in addition increases mucus viscidity.

Post operative factors

- Thoracic or abdominal incision pain inhibits the expectoration of the accumulated bronchial secretions and is the most important cause.

Clinical examination reveals a patient who is dyspnoeic with a rapid pulse and pyrexia. There may be cyanosis. Coughing is painful and unless encouraged the patient may fail to expectorate. The sputum is at first frothy and clear, but may later become purulent. The cough is characteristically a painful frothy cough, resulting from the sound of bronchial secretins rattling within the chest. Chest movements are diminished, particularly on the affected side, there is basal dullness and air entry is reduced with crepitations.

On investigating the patient, a Chest Radiography may reveal opacity of the involved segment and may show mediastinal shift to the affected side.

Prevention is the best form of management. This consists of:

- Cessation of smoking preoperatively.
- Treatment of pre-existing Bronchitis with Bronchodilators and antibiotics.

- Deep Breathing and coughing
- Incentive Spirometry
- Adequate analgesia

If post operative atelectasis does occur then the management is:

- Removal of impacted secretions by coughing
- Active chest percussion and breathing exercises.
- Passive postural drainage.
- Ensure adequate analgesia, which may require an intercostal block in the upper abdominal incisions.
- If the condition is severe then a catheter can be passed into the bronchi and secretions directly aspirated via the nose or an endotracheal tube.
- If the pyrexia is persistent for more than 48 hours then there is a probable secondary chest infection and therefore give antibiotics.
- If aspiration was a possibility then add metronidazole.

SPECIFIC INFECTIONS RELATED TO SURGERY

A. URINARY TRACT INFECTION

Bacteriuria is a very common occurrence in post operative patients, especially in those patients who have bladder catheters. Deciding when bacteria in the urine are actually causing urinary tract disease or fever is a complex challenge.

The clinical presentation of these patients can be in the form of Dysuria, Increased frequency of micturition, Hematuria, Cloudy and foul-smelling urine, High temperature lasting for more than 3 days, Nausea and vomiting, accompanied by high fever indicating a more complicated UTI or may be asymptomatic.

In the post operative period, the majority of infections are related to bladder catheters, although instrumentation, obstruction to the flow of urine, and hematogenous spread are also implicated. Gram-negative bacilli, Enterococci faecalis, and yeast are frequent causative organisms. Less common organisms include Proteus mirabilis, Klebsiella pneumoniae, and Enterococcus spp). (Krieger JN et al 1983)

When clinical evaluation indicates that a laboratory evaluation of fever is appropriate, one specimen of urine should be obtained and evaluated by direct microscopy, Gram stain and quantitative culture.

Urine for culture and urinalysis should not be collected from the drainage bag since multiplication of bacteria can occur while the urine is in the bag. For patients without a Foley catheter in place, a midstream clean catch urine specimen should be collected. Urine collected for culture should be transported to the laboratory rapidly to prevent the multiplication of bacteria within the receptacle during transit. If the transport of urine will be delayed longer than approximately I hour, the specimen should be refrigerated.

The quantity of urinary bacteria that is sufficient to cause a febrile urinary tract infection is unclear. It is likely that most febrile catheter associated urinary tract infections occur with counts $>10^4$ cfu/ml (Critical Care Medicine 1998).

Prevention of these infections in the post operative setting consists of

- Adequate fluid intake in the postoperative period.
- To remove indewelling catheters as early as possible.

The management of most uncomplicated UTIs is with oral antibiotics such as trimethoprim, cephalosporins, or a fluoroquinolone (e.g. ciprofloxacin, levofloxacin).

If the patient has symptoms consistent with pyelonephritis, intravenous antibiotics may be indicated.

B. BILIARY INFECTION POST BILIARY SURGERY

Biliary infection is noticed after open or laparoscopic cholecystectomy, CBD exploration or surgeries on the liver.

C. BLOOD TRANSFUSION (Febrile Nonhemolytic Transfusion Reaction).

A febrile nonhemolytic transfusion reaction is suspected when there is a temperature increase (often defined as equal or more than 1 deg. C) and /or chills occurring during or after a transfusion with no other precipitating cause. As brought out by Gary Stack et al, Febrile reactions often start with the patient feeling uneasy and experiencing chills. In more severe reactions, symptoms may progress from slight tremulousness to true rigors. Less commonly, some patients also can have nausea and vomiting. The fever can first develop between a half-hour after the start of transfusion to 1-2 hours after completion.

Generally, FNHTRs are not life threatening. Mild reactions with temperature elevations of 1-2 deg.C are uncomfortable but are usually self limiting with fever persisting no more than 8-10 hours after the start of transfusion. Fevers persisting for 18-24 hours or more are probably not related to transfusion. Higher rates of temperature elevation post transfusion in some patients can be correlated with a faster rate of infusion and/or a greater passenger leukocyte content in the blood component. The frequency of FNHTR has been estimated at 0.5% per unit of blood component transfused.

FNHTRs are believed to be the result of elevated levels of pyrogenic cytokines in the transfusion recipient. These include IL-1, IL-6, and TNF-alpha, which reach the thermoregulatory centre of the anterior hypothalamus, where they induce the synthesis of arachidonic acid and prostaglandins including PGE 2. This causes alteration of the firing rate of the thermoregulatory neurons which raises the thermostatic set point. The three major settings for the occurrence of FNHTR are:

a) Infusion in recipients alloimmunized to leukocytes or platelets.

b) Infusion of storage - related pyrogenic cytokines.

c) Infusion of bacterially contaminated blood components

Fever is the first sign of FNHTR. Therefore evaluation of a febrile reaction should be undertaken promptly. Reconfirming the ABO type, re-crossmatching of samples, gram stain and culture of bag contents and investigations to rule out other causes of fever and chills must be carried out. FNHTR is frequently a diagnosis of exclusion.

In managing patients with FNHTR, blood transfusion must be stopped immediately. Patient should be hydrated with normal saline and to be reassured that the reaction is usually harmless. Antipyretic therapy must be immediately instituted. Hebert et al documented that leukoreduction was associated with decreased incidence of fever in high risk surgical patients. Unless the patient shows signs of an allergic reaction, there is no indication for antihistamines in the treatment of a febrile transfusion reaction. Following most FNHTR, any unused blood component should be returned to the blood bank and not subsequently transfused.

D. ANAESTHETICS AND WONDER DRUGS

Fever is relatively rare during general anesthesia because volatile anesthetics per se inhibit expression of fever. Anaesthesia widens the inter threshold ranger thus resulting in hypothermia. As a result, general anesthesia impairs the febrile response to pyrogenic stimulation

(Lenhardt R. et al 2001). Clinical management of fever should primarily be directed at identifying and treating the underlying cause. Simple anti-pyretics and simple cooling measures may be helpful in certain situations. Passive intraoperative hyperthermia due to excessive patient heating and active warming should be managed by discontinuing the warming process. The increase in temperature due to malignant hyperthermia is generally managed by intravenous dantrolene sodium.

Any drug can cause fever due to hypersensitivity. Some drugs cause fever by producing local inflammation at the site of administration: Amphotericin B, erythromycin, potassium chloride, and cytotoxic chemotherapies are prime examples. Drugs or their delivery systems (diluent, intravenous fluid, or intravascular delivery devices) may also contain pyrogens or, rarely, microbial contaminants. Some drugs may also stimulate heat production (e.g. thyroxine), limit heat dissipation (e.g. atropine or epinephrine), or alter thermoregulation (e.g. butyrophene tranquilizers, phenothiazines, antihistamines or antiparkinson drugs).

Among drug categories, fever is most often attributed to antimicrobials (especially beta-lactam drugs), anti-epileptic drugs (especially phenytoin), antiarrhythmics (especially quinidine and procainamide) and antihypertensives (methyldopa). There is nothing

characteristic about the fevers induced by these drugs. Fevers do not invariably occur immediately after drug administration: it may be days after administration that fever occurs, and many more days before the fever abates.

The diagnosis of drug-induced fever is usually established by temporal relationship of the fever to starting and stopping the drug. Patients can be rechallenged with the drug to confirm the diagnosis, but this is rarely done unless the drug in question is essential and alternatives are not available.

PYREXIA ON DAYS 3-5

Pulmonary, Infections and Broncho-Pneumonia

In many settings, pneumonia is an easy diagnosis to establish in a febrile patient based on chest radiograph, respiratory secretions, symptoms and signs. In the post operative period, however, it can be difficult to determine whether fever is due to pneumonia when patients have other non-infectious processes producing abnormal chest radiographs and gas exchange (e.g., congestive heart failure, atelectasis, ARDS). Many patients in the post operative ward are either intubated or sedated and cannot cough or have other reasons for abnormal secretions.

Diagnostic Evaluation

An exhaustive history, Physical examination, chest radiograph, and examination of pulmonary secretions comprise the initial evaluation. Supine chest radiographs, erect radiographs, and computerized tomography or magnetic resonance studies provide increasingly useful information. For initial fever evaluations, chest radiographs are generally adequate. Radiographs should be performed in an erect sitting position during deep inspiration if possible. The absence of infiltrates, masses, or effusions on this study does not exclude pneumonia, abscess or empyema as a cause of fever. Clinical judgment is needed to determine whether the suspicion of infection is high enough to warrant a higher resolution study.

Respiratory secretions can be obtained for examination by a variety of techniques including expectoration, saline induction, deep tracheal suctioning, bronchoscopic aspiration, or bronchoscopic or non-bronchoscopic alveolar lavage (Salata RS et al. 1987).

However the specimen should be transported to the laboratory and processed within 2 hours so that fastidious organisms such as Streptococcupneumoniae do not die. For any expectorated specimen, it is important for the laboratory to perform direct microscopy on the

specimen to determine if it represents saliva (i.e. if the predominant cells are epithelial) or lower respiratory secretions (i.e. if the predominant cells are leukocytes).

If the specimen is of lower respiratory origin, in most situations a Gram stain should be performed and the specimen should be cultured for routine aerobic bacteria and antimicrobial susceptibility determined.

The treatment of pneumonia in the post operative set up is by the use of parenteral antibiotics. The antibiotic choice depends on the nature of the pneumonia, the most common microorganisms causing pneumonia, and the immune status and underlying health of the individual. However, a specific cause for pneumonia is identified in only 50% of people, even after extensive evaluation. Because treatment should generally not be delayed in any person with a broncho-pneumonia, empiric treatment should be started well before laboratory reports are available.

2. Wound Infection (Surgical Site Infections)

Infections of surgical incisions are referred to as surgical site infections (SSI). These are recognized as common surgical complications occurring in about 3% of all surgical procedures and up to 20% of patients undergoing emergency intra-abdominal procedures

(Barie PS et al.2002). Potential complications include tissue destruction or prolongation of proper wound healing, incisional hernias, and occasionally bacteremia. Additionally, recurrent pain and disfiguring and disabling scars may also result. Surgical site infections result in substantial morbidity, prolonged hospital stays, and increased direct patient costs. All of these factors have a substantial impact on patients and hospitals and create a huge economic burden. Minimizing SSls is a top priority for surgeons and hospitals to ensure the safest environment for patients undergoing surgery.

Risk Factors for the Development of Surgical Site Infections include: (Cardo DM et al. 1993)

Patient Factors	**Environment Factors**	**Treatment Factors**
Ascites Chronic inflammation Steroid use, Obesity, Diabetes, Extremes of age Skin diseases, Under nutrition	Contaminated medications inadequate ♦ disinfection/ sterilization ♦ Skin antisepsis ♦ Ventilation	♦ Drains ♦ Prolonged hospitalization ♦ Inadequate antibiotic prophylaxis ♦ Emergency procedures ♦ Hypothermia ♦ Prolonged operative time

Classification of wounds by probability of bacterial contamination is the single most important factor in determining the likelihood of development of a wound infection. Traditionally, surgical wounds have been classified as

Class 1 (clean)

Class 2 (clean-contaminated)

Class 3 (contaminated)

Class 4 (dirty)

The validity of this classification scheme is borne out by the results of numerous retrospective and prospective epidemiologic studies of Cardo et al. (1993) that demonstrate consistently that wound infections occur with increasing frequency as one progresses from clean (1% to 3%) to clean-contaminated (4% to 5%), to contaminated (6% to 15%), to dirty (16% to 40%).

In clean surgical procedures in which the gastrointestinal, gynecological, or respiratory tracts have not been entered, Staphylococcus aureus from the exogenous environment or the patient's skin flora is the usual cause of infection .In all other categories of surgical procedures the polymicrobial aerobic-anaerobic flora closely

resembling the normal endogenous micro flora of the surgically resected organ are the most frequently isolated pathogens.

In the preoperative period, the patient should be assessed for factors that can be corrected before elective surgery (Nichols RL et al.1991) Open skin lesions should be allowed to heal. The patient should be free from bacterial infection of any kind and should quit smoking, preferably one month before surgery. They should shower with an antibacterial soap the night before the operation and must not be shaved the night before. The nutritional status must also be improved upon (File TM et al. 1995).

The administration of antibiotics before surgery to reduce postoperative SS1 is common and beneficial in many circumstances. However the antibiotics only protect the surgical incision and antibiotics are not a panacea. Antibiotic prophylaxis is indicated clearly for most clean-contaminated and contaminated operations. Antibiotics for dirty operations represent treatment for an infection, not prophylaxis. Antibiotic prophylaxis of clean surgery is controversial but is generally indicated if prosthesis like a mesh is used.

During the surgical procedure, cosmesis is important, but on the other hand, closure of contaminated or dirty wound is widely believed to

increase the risk of SSIs. Tissues should be handled gently and the use of electrocautery for hemostasis should be minimized.

Impaired glucose control in the post operative period has several deleterious effects upon the host. Immune functions, most notably function of neutrophils and mononuclear phagocytes are impaired. Poor control of blood glucose during surgery and in the preoperative period increases the risk of infection and worsens outcome from sepsis. Therefore tight control of blood glucose plays an important role to decrease SSIs.

Early enteral feeding (within 36 hours) reduces the risk of Nosocomial infection by more than one half among critically ill and injured patients.

In the management of SSIs, the only constant guide is to Incise and drain the incision. Often, opening the incision and applying basic wound care are sufficient provided that the incision is opened wide enough to facilitate wound care and diagnosis of associated conditions such as necrosis that requires debridement or dehiscence which needs reconstruction. Antibiotic therapy is not required for uncomplicated SSIs that are opened and drained adequately and that receive appropriate local care. But antibiotics may be indicated if there is systemic evidence

of toxicity (eg. fever, leukocytosis) or cellulitis that extends more than 2 cm beyond the incision.

INTRAVENOUS LINE PHLEBITIS

It is often referred to by nursing staff as tissuing of the line, although the latter term is often extended to imply any cause of dysfunction of lines.

The phlebitis can be a cause of postoperative fever,

Incidence can be lowered by changing sites every one or two days, although this may be difficult practically, and it may be better to change site when the patient begins to notice discomfort or the adjacent skin begins to redden.

INTRA-ABDOMINAL ABSCESSES (SUBPHRENIC AND PELVIC)

These are localised collections of pus, usually underneath the right or left hemi- diaphragm or in the pelvis. Other sites include the lesser sac. In the operated patient, subphrenic abscesses are the commonest intra-abdominal abscess.

Subphrenic and pelvic abscesses in the post operative period may occur following surgeries for;

- Acute appendicitis.
- Perforated peptic ulcer.
- Perforated gallbladder and biliary surgery.
- resection and anastamosis and subsequent peritoneal faecal contamination
- Infection of a haematoma after splenectomy.

The clinical picture of a subphrenic or pelvic abscess is a patient who develops features of toxicity 2 to 21 days after making an initial recovery after the surgical procedure. These features are:

- Swinging fever.
- Malaise, nausea, weight loss.
- Upper abdominal pain that radiates to shoulder tip
- Breathlessness, due to lower lobe lung collapse or development of a pleural effusion.
- Loose stools.

On examination

- Swinging pyrexia.
- Sometimes abdominal tenderness in the sub costal region and/or signs of a pleural effusion.
- Distension of the abdomen.
- Per rectal examination reveals tenderness and bogginess of the lateral rectal wall.

The diagnosis of these abscesses is by

- Ultrasound or abdominal CT: localises collections of pus
- White cell count: often a leucocytosis of around 20,000
- Chest X-ray
    - Elevated diaphragm on the affected side.
    - May be gas and fluid beneath the diaphragm.
    - Pleural effusion.

The most effective management of a subphrenic abscess is drainage. This may be achieved under ultrasound control or via an open technique.

PYREXIA ON DAYS 5-7

A. Deep Vein Thrombosis (DVT)

DVT is the formation of a thrombus in the deep veins, especially those of the lower limbs such as the femoral or the popliteal veins or the deep veins of the pelvis. Occasionally the veins of the arm are affected (known as Paget-Schrotter disease).

There may be no symptoms referrable to the location of the DVT, but the classical symptoms of DVT include pain, swelling and redness of the leg. In up to 25% of all hospitalised patients, there may be some form of DVT, which often remains clinically in apparent (unless pulmonary embolism develops). Fever is a poor sign of DVT. It should, however, not be ignored, as it was indicative of venous thrombosis in 15% of the patients in the study done by Appleberg et al (1976).

There are several techniques during physical examination to increase the detection of DVT. These include measuring the circumference of the affected and the contralateral limb at a fixed point,

and palpating the thrombosed vein, which is often tender. Physical examination is unreliable for excluding the diagnosis of deep vein thrombosis.

A careful history has to be taken considering risk factors (Tsai A et al. 2002), including the use of oral contraceptive pill, recent long-haul flying, a history of miscarriage {a feature of several disorders that can cause thrombosis). A family history can reveal a hereditary factor in the development of DVT.

It is vital that the possibility of pulmonary embolism is included in the history, as this may warrant further investigation.

As a complication, post-thrombotic syndrome can develop.

Diagnose of DVT is based on

- Testing for fibrin degradation products (D-dimer levels) is an indication of the occurrence of DVT.

- Other blood tests usually performed are:

  Complete blood count

  Coagulation studies : FT, APTT, Fibrinogen, liver enzymes, renal function and electrolytes

- Duplex measurements can reveal a thrombus and the extent of it (i.e. whether it is below or above the knee).

- The gold standard is intravenous venography, to reveal whether the venous supply has been obstructed. Because of its invasiveness, this test is rarely performed.

- Impedance pletnysmography can also be used as a non-invasive alternative.

The management of DVT consists of

- Anticoagulation is the usual treatment for DVT.

- Thrombolysis is generally reserved for extensive clot, e.g. an iliofemoral thrombosis.

- In general, patients are initiated on a brief course (i.e., less than a week) of heparin treatment, while they start on a 3- to 6-month course of warfarin (or related vitamin K inhibitors). Low molecular weight heparin (LMWH) is the type of heparin generally used, though unfractionated heparin is given in patients who have a contraindication to LMWH (e.g., renal failure or imminent need for invasive procedure).

- In patients who cannot have anticoagulant treatment (e.g., cerebral hemonhage) or those who have recurrent PEs while on anticoagulation, an inferior vena cava filter may prevent pulmonary embolisation of the leg clot.

DVT can be prevented by

- In patients who have undergone surgery, low molecular weight heparins (LMWH) are routinely administered to prevent thrombosis.

- Early and regular ambulation (walking) is a treatment that predates anticoagulants and is still recognized and used today. Walking activates the body's muscle pumps, increasing venous velocity and preventing stasis.

- Intermittent pneumatic compression (IPC) machines have proven protective

- In bed ridden patients at very high risk or with contraindications to heparins.

B. **Specific Complications Relating to Surgery**

- Bowel Anastamosis breakdown, fistula formation

Pyrexia after First Week

A. Wound infection

B. Distant sites of sepsis

C. DVT

Garibaldi et al. (1993) in a prospective study of 81 patients who developed unexplained fever, found that 80% those with fever on the first post operative day had no infection. However, the situation was quite different for patients who developed fever on or after the fifth day following surgery, as approximately 90% of these patients had an identifiable infection, in most cases would infection (48%), UTI (29%), or Pneumonia (12%).

Material and Methods

MATERIALS AND METHODS

This study on the evaluation of post operative pyrexia is based on 110 patients admitted to Government Stanley Hospital during the period from May 2008 to October 2010, and who underwent surgery (both elective and emergency) for various pathologies. The study includes 45 females and 65 males and covers an age group between 10-70 years. Data collected for each patient had been recorded in a designed chart.

- All the 110 patients were analysed for some form of preoperative co-morbidity like diabetes mellitus, hypertension, obesity, ischemic heart disease and sepsis.

- All the 110 patients had antibiotics, belonging to one of the 3 regimes

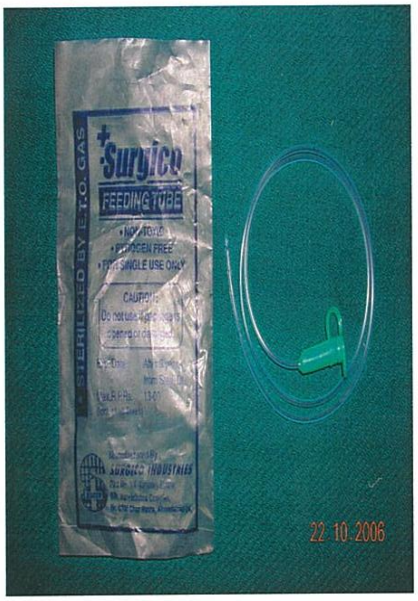
  Regimen 1 : Inj. Ampicillin + Gentamycin IV BD

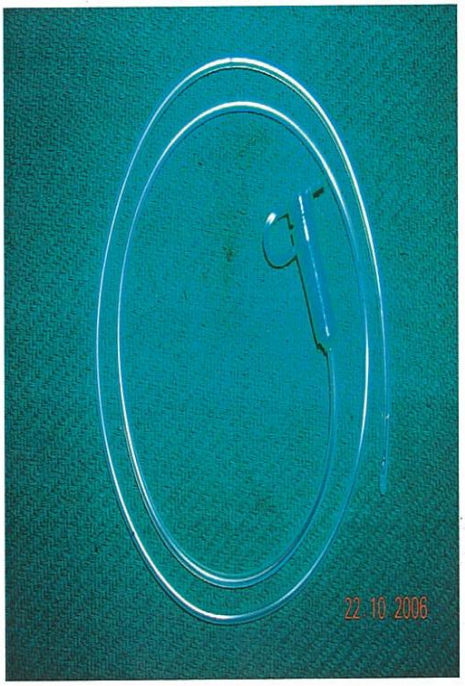
  Regimen 2 : Inj.Cipofloxacin + Metrogyl IV BD

  Regimen 3 : Inj.Cefotaxime + Inj. Gentamycin IV BD

- The effect of the duration of the surgical procedure and the type of anaesthesia given has also been correlated to the incidence of post operative pyrexia.

SEGMULAR DRAINS





INFANT FEEDING TUBES USED AS SEGMULAR DRAINAGE TUBES.

- A note of all intraoperative problems encountered was made.

- SEGMULAR DRAINAGE tubes were placed in the subcutaneous plane in 37 patients and the resultant advantage has been compared to cases where no drainage tube was used. Infant feeding tubes were used for the purpose of drainage. All the cases where segmular drainage tubes were used, a thorough wound irrigation was carried out prior to closure of the subcutaneous tissue. A minimum of three tubes were inserted into the subcutaneous plane prior to skin closure. Photographs of the drainage tube and its placement are enclosed.

- The effect of the duration of the surgical procedure and the type of anaesthesia given has also been correlated to the incidence of post operative pyrexia.

- The temperatures were measured by using the mercury thermometer. The degree of pyrexia is expressed in degrees Fahrenheit. These values were recorded on a day to day basis in the GRAPHIC TPR CHART used in the Hospital. Oral temperatures were measured for all patients.

- The day on which pyrexia appeared, its nature and the corresponding temperature in Fahrenheit has been tabulated.

HCP Ms–104–Medl.I–45c

Government _____ Hospital _____

GRAPHIC (T.P.R.) CHART

Name	Age	MRD No.

DATE								
No. OF DAYS								
DAYS POST. OP.								
TIME								
PULSE	C	TEMP F°						
210 340	41.1	106						
200 320	40.6	105						
190 300	40.0	104						
180 280	39.4	103						
170 260	38.9	102						
160 240	38.3	101						
150 220	37.8	100						
140 200	37.2	99						
130 180	36.7	98						
120 160	36.1	97						
110 140	35.6	96						
100 120	35.0	95						
90 100	RESP. 60							
80 80	50							
70 60	40							
60 40	30							
50 20	20							
40 B.P.D.	10							
STOOLS								
URINE								
SPUTUM								
WEIGHT								
BATH								

- All patients were mobilised as early as possible to prevent Deep Vein thrombosis.

- All patients were advocated active breathing exercises, especially those who underwent upper GI surgeries, to prevent Atelectasis and Broncho- pneumonia.

- All wounds were examined on the third post operative day and managed accordingly.

- All patients had a detailed clinical examination to identify the suspected Etiology of pyrexia. Pertinent investigations were carried out to identify the exact cause.

- Patients with would infection had swabs done and antibiotics were administered according to the sensitivity of the organism identified by plate culture.

- Respiratory causes of pyrexia were identified by a basic chest X-ray and sputum culture and throat swab in certain cases.

- Suspected urinary tract infection was confirmed by catheter tip culture (streak culture) and urine culture and sensitivity.

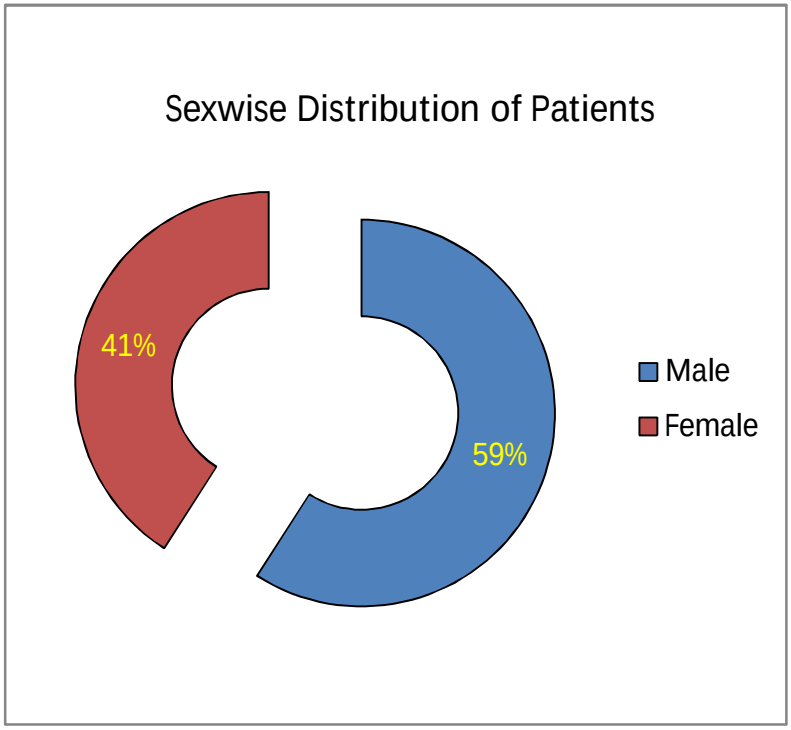
- Abdominal surgeries complicated by intra abdominal collections and anastamotic leaks were identified by using ultrasound examination.

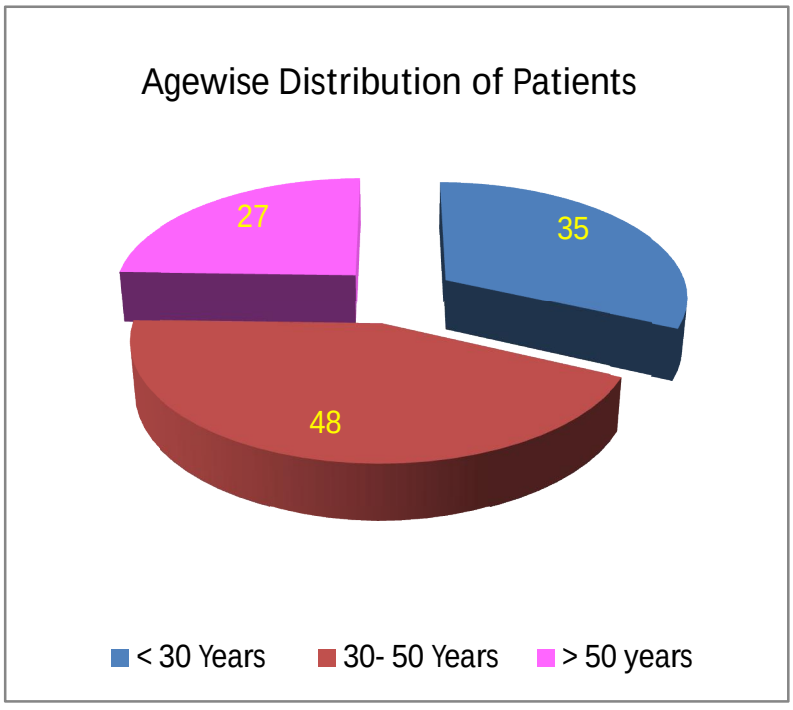
- For patients with IV cannula site sepsis, infected cannula was removed and its lip and the blood were sent for culture and sensitivity.

- Depending upon the Etiology of pyrexia, one of the 3 treatment modalities (medical, surgical or conservative) was instituted and the outcome has been studied.

- Hematomas and seromas were let out, superficial wound infections managed with antibiotics, intra abdominal collections let out using USG guided aspiration or open surgical technique and DVT prevented by mobilizing patients early.

Observation


Sexwise Distribution of Patients
41%
59%
Male
Female


Agewise Distribution of Patients
27
35
48
< 30 Years
30- 50 Years
> 50 years

OBSERVATION

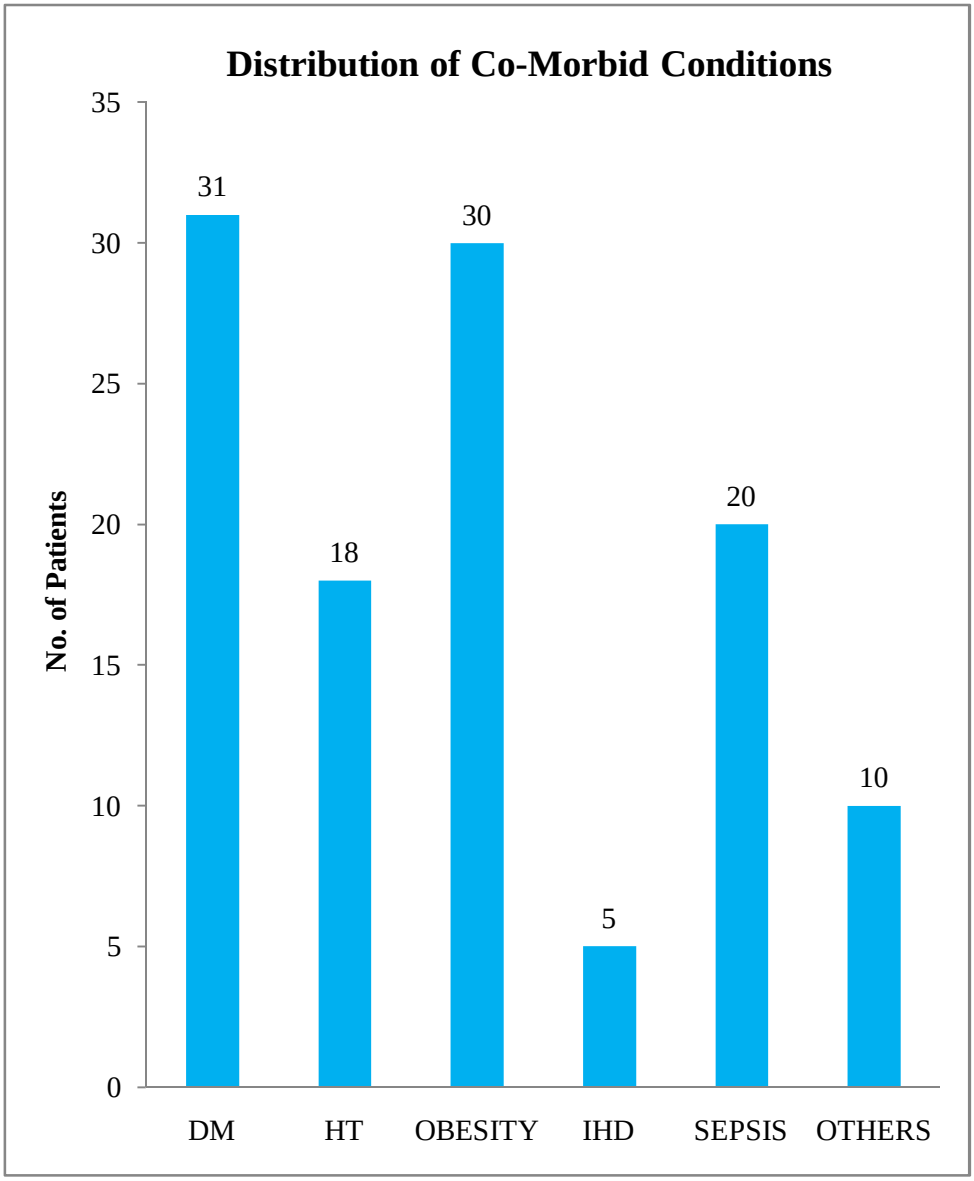
- Of the total number of patients (110 cases) who developed pyrexia, 65 patients were males and the remaining 45 were females.

Sex	No. of Patients
Male	65
Female	45
Total	**110**

- 35 patients were younger than 30 years. 48 patients belonged to the age group between 30-50 years and 27 patients were above the age of 50 years.

Age Group	Number of cases
< 30 years	35
30 – 50 years	48
> 50 years	27
Total	**110**

- The most common pre-operative co morbidity associated with pyrexia was Diabetes Mellitus (28.1%) and obesity (27.2%) to follow. Ten patients had other co morbid conditions like dehydration, malnutrition etc.


Distribution of Co-Morbid Conditions
No. of Patients
35
30
25
20
15
10
5
0
31
18
30
5
20
10
DM
HT
OBESITY
IHD
SEPSIS
OTHERS

Co-Morbid Conditions	No. of Patients	Percentage
DM	31	28.1
HT	18	16.3
Obesity	30	27.2
IHD	5	4.5
Sepsis	20	18.4
Others	10	9.0

- Majority of patients (37.2%) had only one pre-operative co-morbidity and only one patient had all 5 problems.

No. of Morbidities	No. of Patients
Nil	39
One	41
Two	19
Three	10
Five	1
Total	**110**

- Of the 110 cases studied, 85 cases were elective and 25 were emergency surgeries and General Anaesthesia was the most common form of anaesthesia used on 55 patients (50%).

- It was noted that in a majority of cases (69.1%), pyrexia was noticed on the first post operative day, 76 Patients (69.1) and on the second post operative day 56 patients had fever. In 33 patients the fever occurred after the first week. The frequency of occurrence of pyrexia on the different post operative days is shown below:

Day of Pyrexia	No. of Cases	Percentage
Fever Day 1	76	69.1
Fever Day 2	56	50.9
Fever Day 3	30	27.2
Fever Day 4	30	27.2
Fever Day 5	31	28.1
Fever Day 6	24	21.8
Fever Day 7	31	28.1
Fever Week 2	29	26.3
Fever Week 3	3	2.7
Fever Week 4	1	0.9

- The Temperature increase and the Maximum and Minimum Temperatures noted on the different days of fever are shown below:

Day of Pyrexia	Mean	Minimum	Maximum
Temp. Day 1	101.3	100.0	103.6
Temp. Day 2	101.2	100.2	102.6
Temp. Day 3	101.1	100.4	102.8
Temp. Day 4	101.2	100.0	102.6
Temp. Day 5	101.3	100.0	102.6
Temp. Day 6	101.2	99.6	102.4
Temp. Day 7	101.0	100.0	102.4
Temp. Week 2	100.9	100.2	101.8
Temp. Week 3	101.2	100.2	102.0
Temp. Week 4	100.8	100.8	100.8

- The most common type of fever noted was intermittent (91.8%) and only 6 patients had a continuous fever (5.5%).

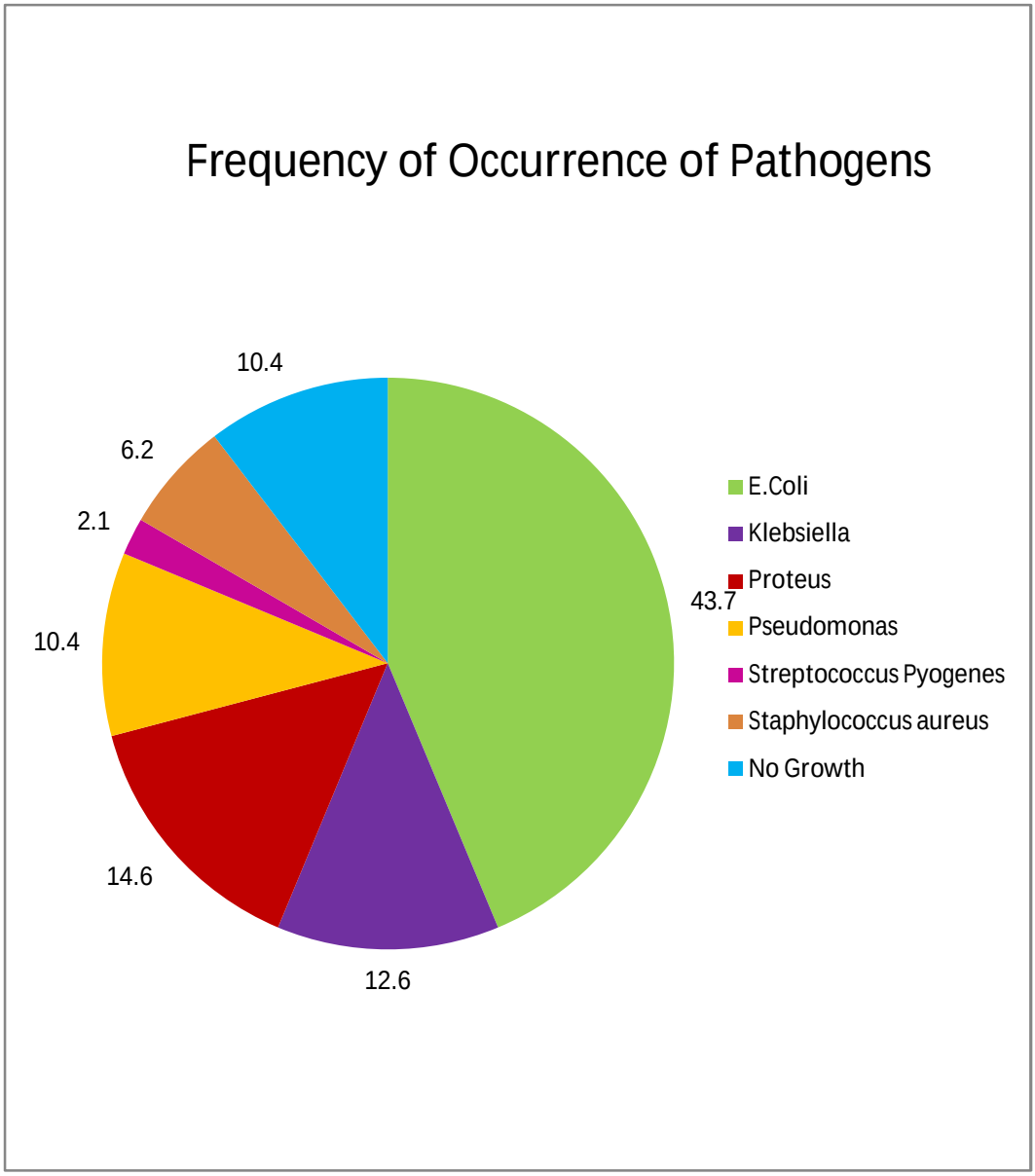
No. of Morbidities	No. of Patients	Percentage
Intermittent	101	91.8
Remittent	3	2.7
Continuous	6	5.5
Total	**110**	**100.0**

- The most common Etiology of pyrexia was wound infection (37%) followed by seroma (27%).The data collected on the etiology is presented below;

Etiology	Incidence	
	No. of Cases	**Percentage**
Tissue damage	23	20.9
Hematoma	6	5.4
Seroma	30	27.2
Infection	41	37.2
Uri/Iri	2	1.8
Atelectasis	2	1.8
Bronchopneumonia	3	2.7
IV line sepsis	3	2.7
Drain site sepsis	4	3.6
Abscess/ Collections	7	6.3
Urinary cath sepsis	8	7.2
Septicemia	3	2.7

- The most common causes of pyrexia on the days 1-2, 3-5, 6-7 and after the first week were noted and outcomes analyzed.

- The pathogen profile was studied by culturing the specimens in suitable media and the results interpreted and correlated to the occurrence of post operative pyrexia. The most common organism


Frequency of Occurrence of Pathogens
10.4
6.2
2.1
10.4
14.6
12.6
43.7
E.Coli
Klebsiella
Proteus
Pseudomonas
Streptococcus Pyogenes
Staphylococcus aureus
No Growth

grown was E.Coli (43.7%). The data collected has been summarized below:

Type of Organism	Frequency	Percentage
E.Coli	21	43.7
Klebsiella	6	12.6
Preteus	7	14.6
Pseudomonas	5	10.4
Streptococcus Pyogenes	1	2.1
Straphylococcus Aureus	3	6.2
No growth	5	10.4
Total	**48**	**100.0**

Majority of patients who had post operative pyrexia made a complete recovery (88.2%) and a total of 6 deaths were noted.

Outcome	Frequency	Percentage
Complete recovery	97	88.2
Complications	7	6.4
Death	6	5.4
Total	**110**	**100.00**

D iscussion

DISCUSSION

The analysis of data consisting of 110 patients who developed post operative pyrexia between the period May 2008 and October 2010 at Govt. Stanley Hospital is presented here. The correlation between different variables and the occurrence of pyrexia is discussed.

AGE AND SEX CORRELATION

From the statistical analysis of data collected it was evident that AGE AND SEX do not significantly contribute to the occurrence of postoperative pyrexia and the outcome after the febrile phase (not statistically significant).

Age	Complete recovery (No.of patients)	Complication (No.of patients)	Death (No.of patients)
< 30	31	2	2
30 – 50	43	2	3
> 50	23	3	1

Sex	Complete recovery (No. of patients)	Complication (No.of patients)	Death (No.of patients)
Male	57	3	5
Female	40	4	1

CORRELATION WITH COMORBID CONDITIONS

The effect of preoperative problems which the patients had were compared to the various etiologies of pyrexia. It was found that the more the number of preoperative co morbid problems (like diabetes mellitus, hypertension, IHD, sepsis, obesity) encountered, the more was the complication rate and delay in recovery from the pyrexial phase.

If any one of these preoperative co morbidity was present, then the incidence of complications like seroma ($P<0.05$*), infection ($P<0.01$**), atelectasis ($P<0.01$**) was more and the data analysis was found to be statistically significant. In one study of 2345 patients undergoing cardiac surgery, the overall incidence of Surgical Site Infection was 8.5 %.(Malone DL et al 2002). The relative risk for the

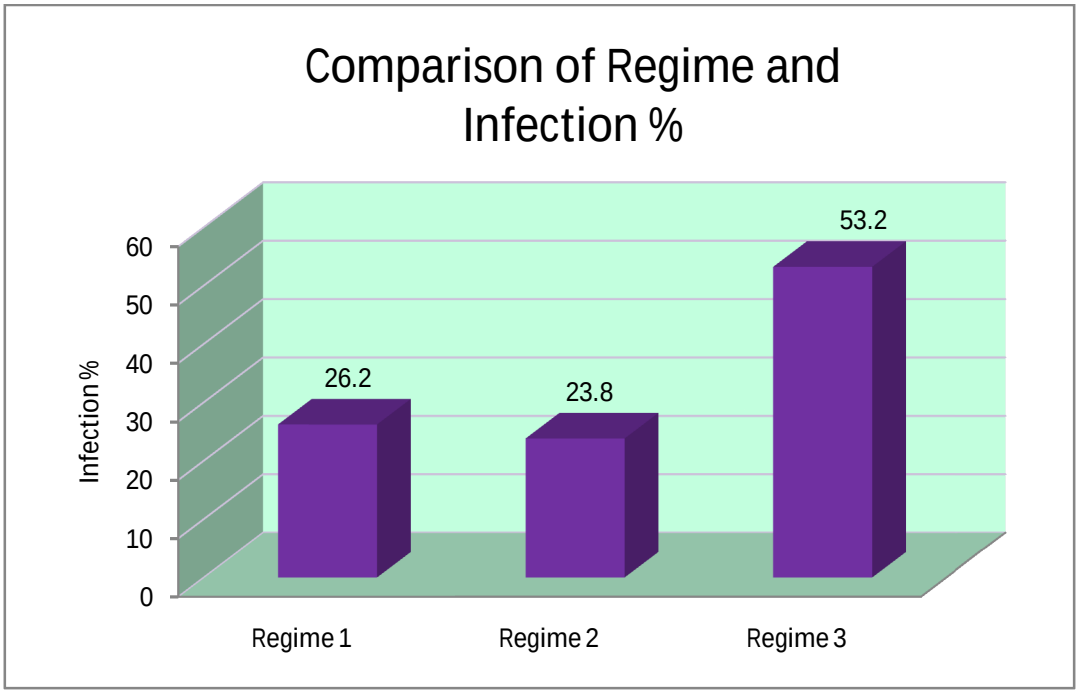
development of Surgical Site Infection was significantly more if co morbidities like diabetes and obesity were present.

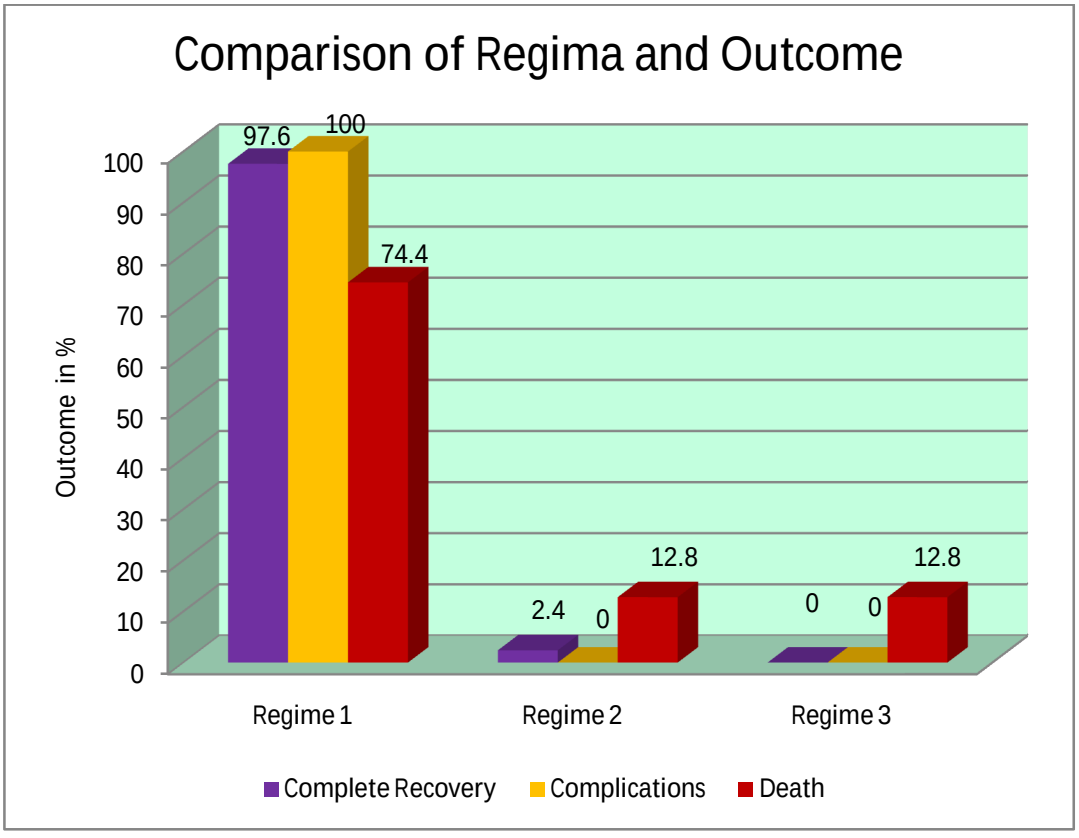
When the preoperative problems were compared to the different outcomes (like complete recovery, complications, death), then it was found that these problems significantly contributed to the incidence of postoperative pyrexia. The P value was <0.01** which is statistically significant at 1% level.

It was also found from the present study that when preoperative co morbidity is present the incidence of pyrexia was more on days 3,5,6,7 and second week and this was statistically significant. The P value for such patients with fever on day 3 is <0.01** and <0.05* on the 5th and 6th day.

CORRELATION WITH THE USE OF PREOPERATIVE ANTIBIOTICS

As already put forth, all patients with pyrexia were given pre operative antibiotics which were continued in the post operative period, depending upon the clinical situation. The use of antibiotics reduced the rate of infection and this; was significant statistically (P<O.O1**). In a study by Classen et al in 1992, the overall risk of development of SSI was just 1.5% when antibiotics were used in the perioperative period.


Comparison of Regime and Infection %
Infection %
60
50
40
30
20
10
0
26.2
23.8
53.2
Regime 1
Regime 2
Regime 3


Comparison of Regima and Outcome
Outcome in %
100
90
80
70
60
50
40
30
20
10
0
97.6
100
74.4
2.4
0
12.8
0
0
12.8
Regime 1
Regime 2
Regime 3
Complete Recovery
Complications
Death

	Infection Present		Infection Absent	
	No	**%**	**No**	**%**
Regime 1	11	26.2	31	73.8
Regime 2	5	23.8	16	76.2
Regimen 3	25	53.2	22	46.8

It can also be noted that regime 1 was found to be more effective in preventing and controlling infection.

** denotes significant at 1 % level.

* denotes significant at 5% level.

It was found from the present study that the use of antibiotics affected the outcome of the patient and recovery from the febrile phase, significantly (P0.01**).

Age	**Complete Recovery (%)**	**Complication (%)**	**Death (%)**
Regimen 1	97.6	2.4	Nil
Regimen 2	100	Nil	Nil
Regimen 3	74.4	12.8	12.8

It is evident that regime 3 is highly ineffective in controlling infection. A total of 6 deaths and 6 cases with complications were encountered when this regime was used

CORRELATION WITH THE TYPE OF SURGERY

The type of surgery (elective or emergency) was compared to the outcome (complete recovery, complications, death) of the patient on recovering from the febrile phase. It was found that the type of surgery was not significantly associated with the outcome.

Surgery Type	Complete Recovery	Complication	Death
Emergency	21	1	3
% of cases	84	4	12
Elective	76	6	3
% of cases	89.4	7.1	3.5

But it is evident from the above table that the complete recovery from the febrile phase after elective surgery is higher than for emergency cases (89.4% vs 84%).

In the present study the type of surgery did not have any particular correlation with the day or degree of pyrexia.

Also there was no significant correlation between the type of surgery and the occurrence of different complications. But the occurrence of seroma has been significantly associated (P<0.01**).

CORRELATION WITH THE TYPE OF ANAESTHESIA

The incidence of pyrexia and the occurrence of lower and upper respiratory tract infections was found to be significant if General Anaesthesia was used as a mode of anaesthesia (P<0.01**).There were no other significant correlations between type of anaesthesia and the occurrence of pyrexia or the outcome of the patient.

** denotes significant at 1% level.

* denotes significant at 5% level.

CORRELATION WITH THE DURATION OF SURGERY

One of the aims of the study was to analyze if the duration of surgery had any correlation to the day on which the pyrexia appeared and it was found that the fevers occurring on day 3 (P<0.01**), day 5 {PO.01**), day 6 (P<0.01**), day 7 (PO.01**) were associated

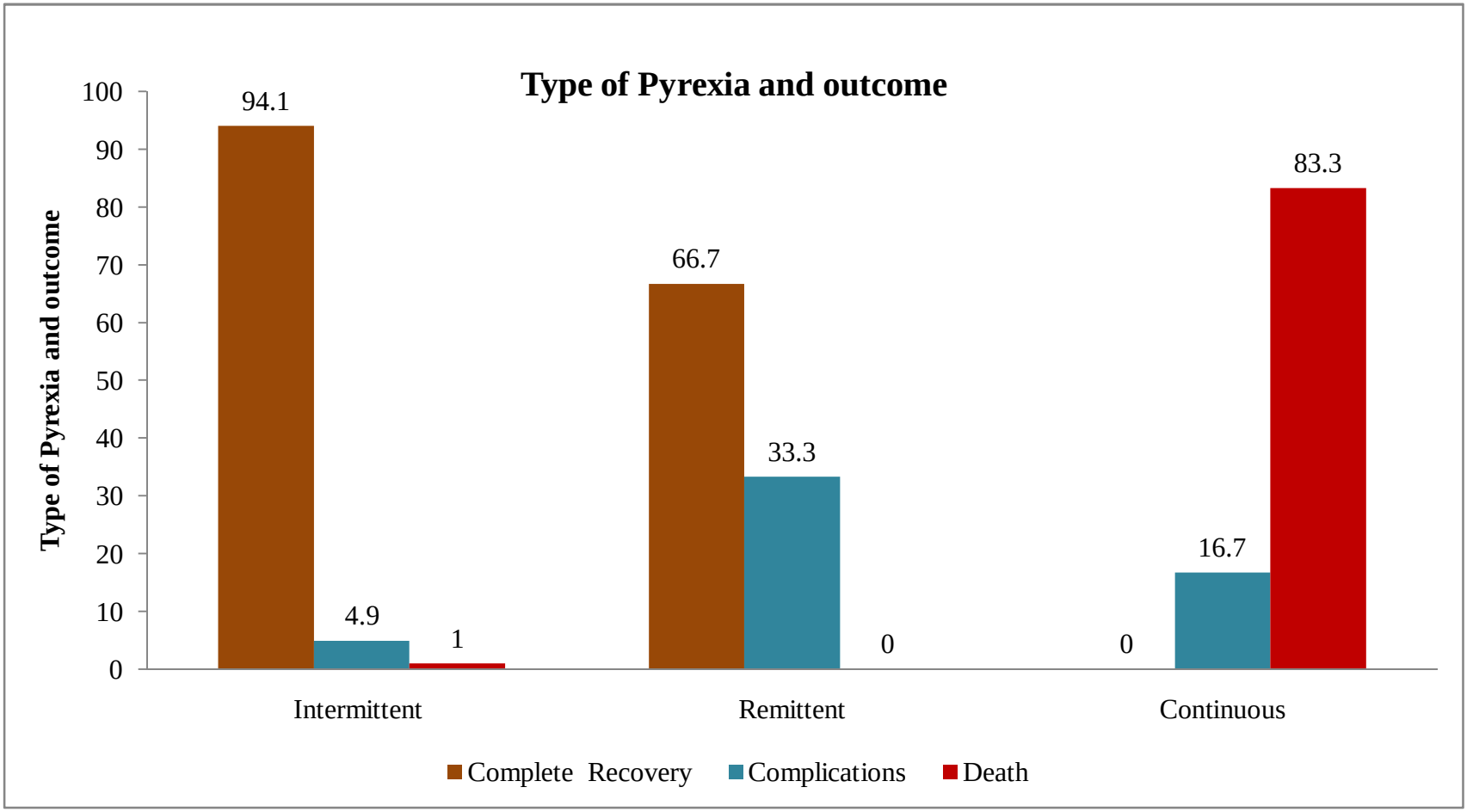
significantly to the duration of the surgical procedure. The more the duration of surgery, the higher was the degree of pyrexia.

This is related to the higher incidence of tissue damage and seroma (P<0.01**) and it may also be due to blood transfusion given during the surgical procedure to compensate for the blood loss on table(P<0.01**). One patient in the present study had continuous type of pyrexia and ultimately died of Myocardial Infarction where the duration of surgery was found to be more than three and half hours. In the study by M. A. Minettoet. al., (2006), the amount of IL-6(pyrogenic cytokine) increase was found to correlate with the duration of the surgical procedure and therefore the higher incidence of pyrexia in patients who had a prolonged surgery.

** denotes significant at 1% level.

* denotes significant at 5% level.

The infection rate and therefore the occurrence of pyrexia were significantly related to the duration of surgery (P<0.05*).Thus more the duration of the surgical infection the more is the infection rate.

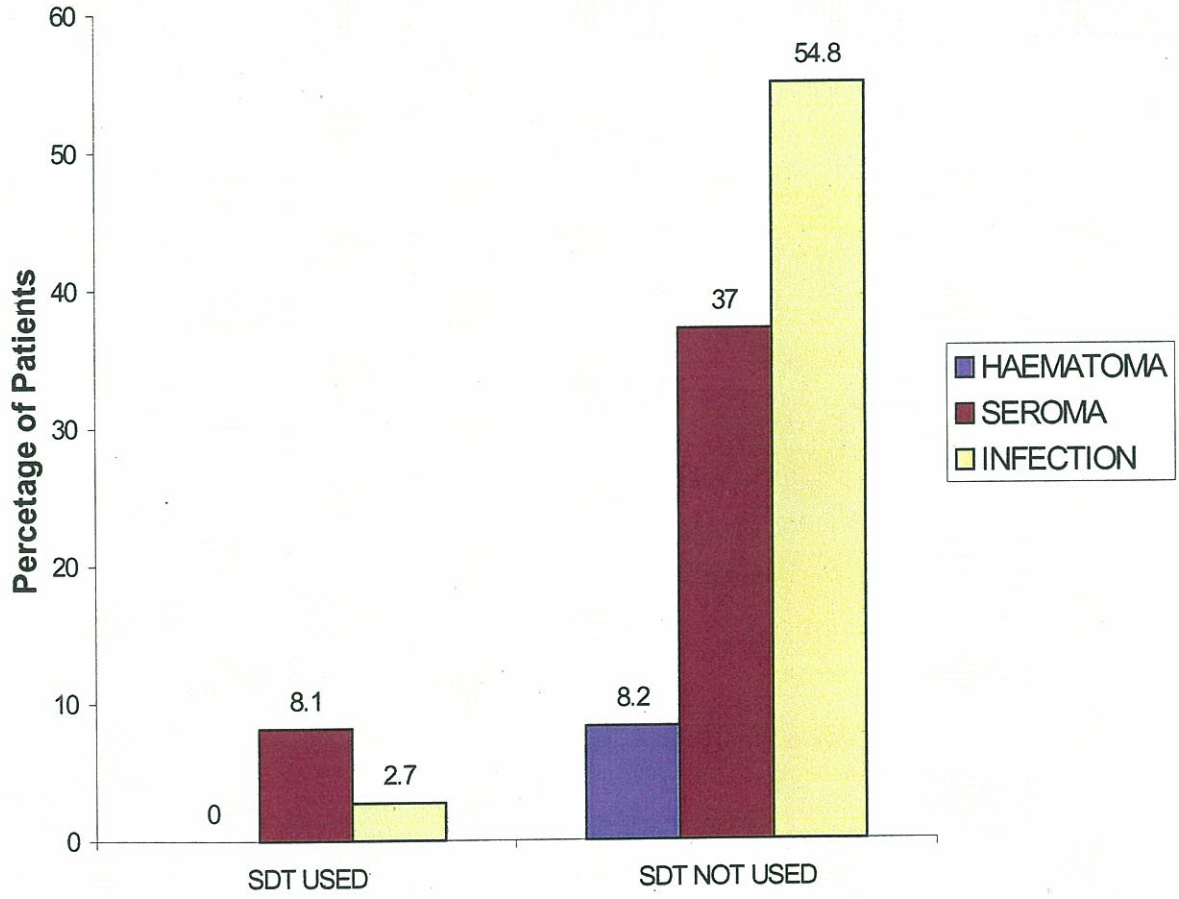

Type of Pyrexia and outcome
Type of Pyrexia and outcome
100
90
80
70
60
50
40
30
20
10
0
94.1
4.9
1
66.7
33.3
0
0
16.7
83.3
Intermittent
Remittent
Continuous
Complete Recovery
Complications
Death

CORRELATION TO THE TYPE OF PYREXIA

The type of fever was correlated to the outcome of the patient recovering from the stress of post operative pyrexia and this was found to be statistically significant (P<0.01**). All but one patient with a continuous type of fever from first post operative day had 100% mortality. Where as, patients with intermittent pyrexia invariably had a complete recovery.

Type of fever	***No. of Cases***	***Complete Recovery***	***Complication***	***Death***
Intermittent	101	95	5	1
% of total		94.1	4.9	1
Remittent	3	2	1	0
% of total		66.7	33.3	0
Continuous	6	0	1	5
% of total		0	16.7	83.3

STUDIES ON EFFECTIVENESS OF SEGMULAR DRAINAGE TUBES (SDT)



CORRELATION TO THE USE OF SEGMULAR DRAINAGE TUBES

Yet another aspect of the study was to correlate the incidence of pyrexia and its varied etiologies to the use of segmular drainage tubes.

According to Al-Inany et al (2002), in a study on the use of subcutaneous drains in obese females undergoing cesarean sections, the rate of Surgical Site Infection is not reduced but in fact is raised.

In our study, of the 110 patients, segmular drainage tubes were used in 37 patients and in 73 patients none were used. But the incidence of wound complications like haematoma, Seroma and wound infection were significantly less in patients in whom these drains were used. This association is found to be statistically significant.

Segmular Dt	No. of Patient	Haematoma Present	Hamaetoma Absent
Used	37	0	37
% of total		0	100
Not used	73	6	67
% of total		8.2	91.8

EFFECTIVENESS OF SEGMULAR DT IN PREVENTING WOUND COMPLICATIONS.

52 year old male patient, who underwent mesh repair for a right indirect inguinal hernia, where segmular DT was NOT USED. The presence of wound induration, edema and collection of seroma is noted.

34 year old male who underwent left herniorraphy where segmular DT was USED. The absence of wound complications is evident.

Segmular Dt	No. of Patient	Seroma Present	Seroma Absent	P Value
Used	37	3	34	<0.01**
% of total		8.1	91.9	
Not used	73	27	46	
% of total		37	63	

Segmular Dt	No. of Patient	Infection Present	Infection Absent	P Value
Used	37	1	36	<0.01**
% of total		2.7	97.3	
Not used	73	40	33	
% of total		54.8	45.2	

Thus it can be seen from the above data, that the use of segumular drainage tubes significantly reduces the incidence of wound complications like Haematoma, Seroma, Wound infections and thereby reducing the occurrence of postoperative pyrexia. But this needs further studies with larger number of patients to evaluate the effectiveness in various other clinical scenarios.

CORRELATION WITH INTRAOPERATIVE PROBLEMS

The intra operative problems like difficulties during surgery and tissue handling, bleeding, presence of sepsis like peritonitis, intra operative hypotension were correlated to the outcome and the findings were statistically significant at 5% level (P<0.05*). It can be noted from the table below, that 6 patients who had intra operative problems, died due to some complication, whereas none died if no intra operative problem was encountered. Complete recovery was seen in 92.6% of patients with no intra operative problems.

Intra operative problems	No. of Patient	Complete Recovery	Complication	Death	P Value
Present	56	47	3	6	0.04502
% of cases		83.9	5.4	10.7	
Absent	54	50	4	0	
% of cases		92.6	7.4	0	

It was also noted from the present study that fever occurring on days 2 (PO.01**), 3 (PO.05*), 6(P<0.05*), 7(P<0.01**}, were associated in a significant manner to the presence of intra operative

problems. The etiology of pyrexia and the day on which the fever occurred was also correlated in order to find out the most common cause of pyrexia on days 1 to 2 ,3 to 5, 6 to 7 and after the first week.

** denotes significant at 1% level.

* denotes significant at 5% level.

PYREXIA ON DAYS 1-2

On the first two immediate post operative days 84 patients out of the total 110 patients developed pyrexia. The most common cause of pyrexia in this period was found to be mainly due to wound complications like Haematoma, Seroma and Tissue damage and Necrosis due to surgery. Although infection was noted to cause fever on the first two days, in 27.4% of the case it is comparatively less than the occurrence on the subsequent days.

In the article by James et al (2006), most early post operative fevers (within the first 48 hours) had no clearly defined infectious cause and resolved without therapy.

Other causes of pyrexia in the first two postoperative days include post operative atelectasis, other site sepsis, thrombophelebitis of intra

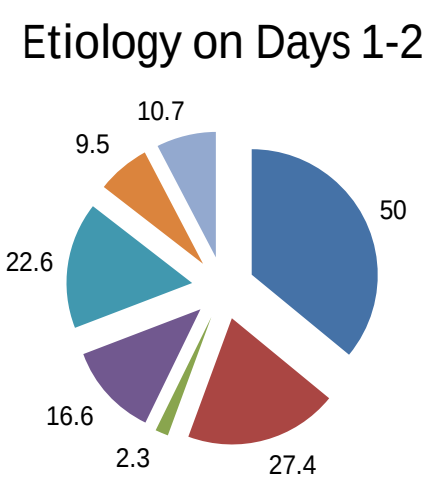
venous lines and blood transfusion. But statistically, these etiologies are not significant.

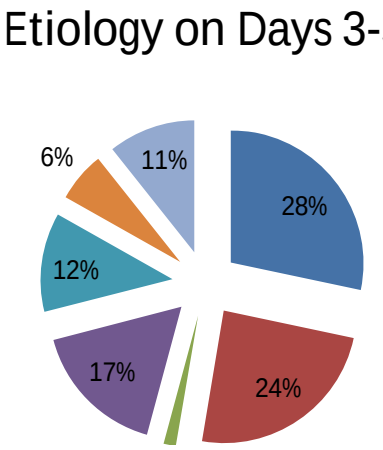
Etiology	No. of Cases	% of total
Wound complications	42	50
Wound infections	23	27.4
Atelectasis	2	2.3
Other site sepsis	14	16.6
Phelebitis	19	22.6
Blood transfusion	8	9.5
Others	9	10.7

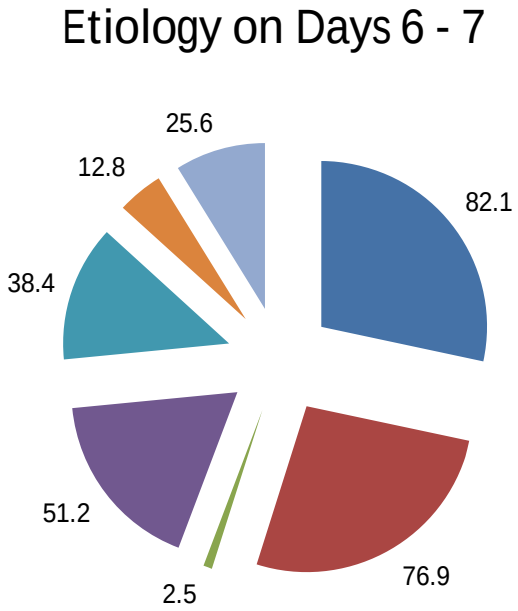
PYREXIA ON DAYS 3-5

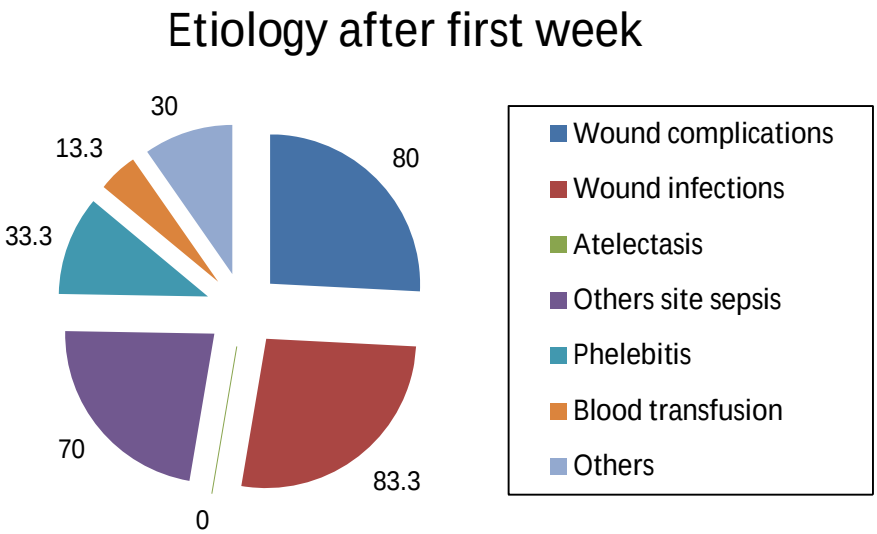
Between Days 3 to 5, out of a total of 110 patients only 44 patients developed fever. The most common etiology causing pyrexia was noted to be wound infection and other site sepsis like infection of intra venous lines, drip and drain site infections, abscesses and collections (sub phrenic or pelvic) depending upon the type of surgery performed. Three cases of bronchopneumonia were also noted during this period. Other causes include phlebitis seroma, blood transfusion etc. These data are similar to ones noted by Ivor J Lim et al (2003).

ETIOLOGIES ON DIFFERENT DAYS OF PYREXIA









Etiology	No. of Cases	% of total
Wound complications	37	84.1
Wound infections	32	72.7
Atelectasis	2	4.5
Other site sepsis	22	50.0
Phelebitis	16	36.3
Blood transfusion	8	18.1
Others	14	31.8

PYREXIA ON DAYS 6-7

In the present study, 39 patients developed pyrexia between postoperative days 6 and 7. Literature suggests that the most common cause of pyrexia on the postoperative days 6 and 7 is **venous thrombosis in** the **pelvis and limbs.** Since all our patients were mobilized early and were given at most postoperative care, none of them developed venous thrombosis and pulmonary embolism. The common cause of pyrexia in our study was wound complications, wound infection and other site infection, with contributions from other causes like phlebitis, anastomotic leak, gastrointestinal fistulae and malignancy.

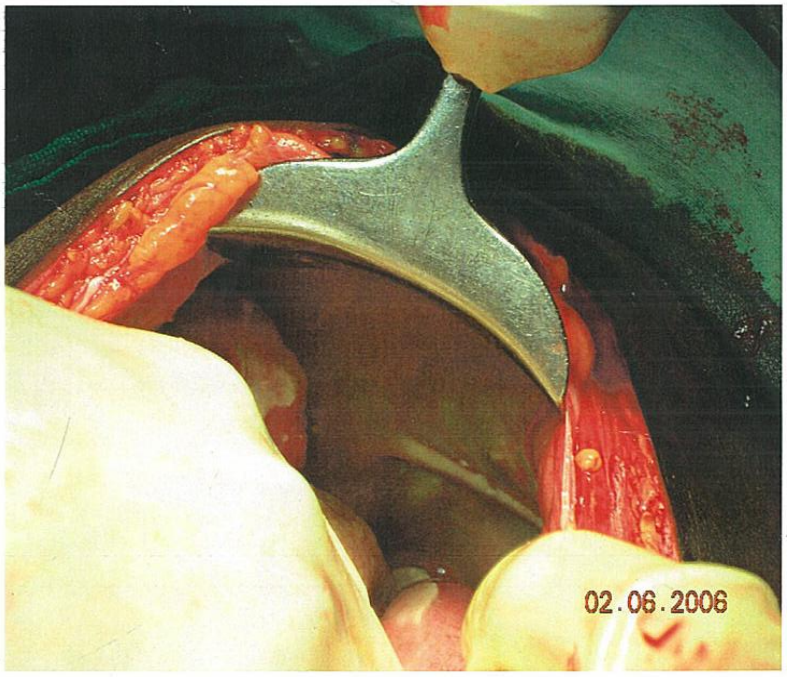
Etiology	No. of Cases	% of total
Wound complications	32	82.1
Wound infections	30	76.9
Atelectasis	1	2.5
Other site sepsis	20	51.2
Phelebitis	15	38.4
Blood transfusion	5	12.8
Others	10	25.6

PYREXIA AFTER THE FIRST WEEK

After the first week, only 30 patients developed pyrexia in the present study. The causes were less likely to be directly related to specific operations undertaken. Here the etiologies include wound sepsis, distant site sepsis, phlebitis and blood transfusion.

Etiology	No. of Cases	% of total
Wound complications	24	80.0
Wound infections	25	83.3
Atelectasis	0	0.0
Other site sepsis	21	70.0
Phelebitis	10	33.3
Blood transfusion	4	13.3
Others	9	30.0

45 year old diabetic female patient, with pyrexia due to entero cutaneous fistula.



A patient with a pelvic abscess and postoperative pyrexia.

CORRELATION TO THE ORGANISM

There was no definite correlation between the occurrence of pyrexia and the type of organism grown in culture. Several common pathogens were grown from samples sent to the microbiology department. The most common pathogen implicated in sepsis was E.Coli. Other organisms grown were pseudomonas, proteus, klebsiella, staphylococcus and streptococcus. There was a subset of patients in whom there was no growth in culture. Perhaps this was the effect of antibiotics use in the perioperative period. Our data has been compared with the study conducted by Emori et al (1993), where the most common organism isolated in cultures was staphylococcus. This difference may be due to the different type of antibiotics used and the higher incidence of MRSA (Methicillin Resistant Staphylococcus Aureus) in the west. The frequency of occurrence of these pathogens is depicted in the diagram.

MANAGEMENT OF POSTOPERATIVE WOUND COMPLICATIONS.

SECONDARY SUTURING OF WOUND FOLLOWING A POST APPENDICECTOMY WOUND GAPING DUE TO INFECTION.

Type of Organism	Perentage (Emori et al)	Percentage (Present study)
E.Coli	8.0	43.7
Klebsiella	4.0	12.6
Proteus	8.0	14.6
Pseudomonas	8.0	10.4
Streptococcus Pyogenes	6.0	2.1
Staphylococcus aureus	19.0	6.2
No Growth	-	10.4
Others	47.0	0.0
Total	**100.0**	**100.0**

TREATMENT AND OUTCOME

The entire population of 110 patients was managed by medical, surgical or conservative lines. Patients with mild pyrexia were managed conservatively by offering simple antipyretics. Other minor complications like pulmonary and urinary tract infections were managed with medical measures. Wound complications like hematonia, seroma, infection was managed by letting out the collection and followed by secondary suturing once the wound showed signs of healing. Collections inside the abdomen were let out under ultrasound guidance. The total of 6 deaths which occurred was found to be directly related to the presence of co morbidities and problems in the peri operative period.

Conclusion

CONCLUSION

- Postoperative pyrexia is a common occurrence in the first 48 hours after surgery and the etiology can be difficult to establish in certain clinical situations. This poses great diagnostic dilemmas to the operating surgeon.

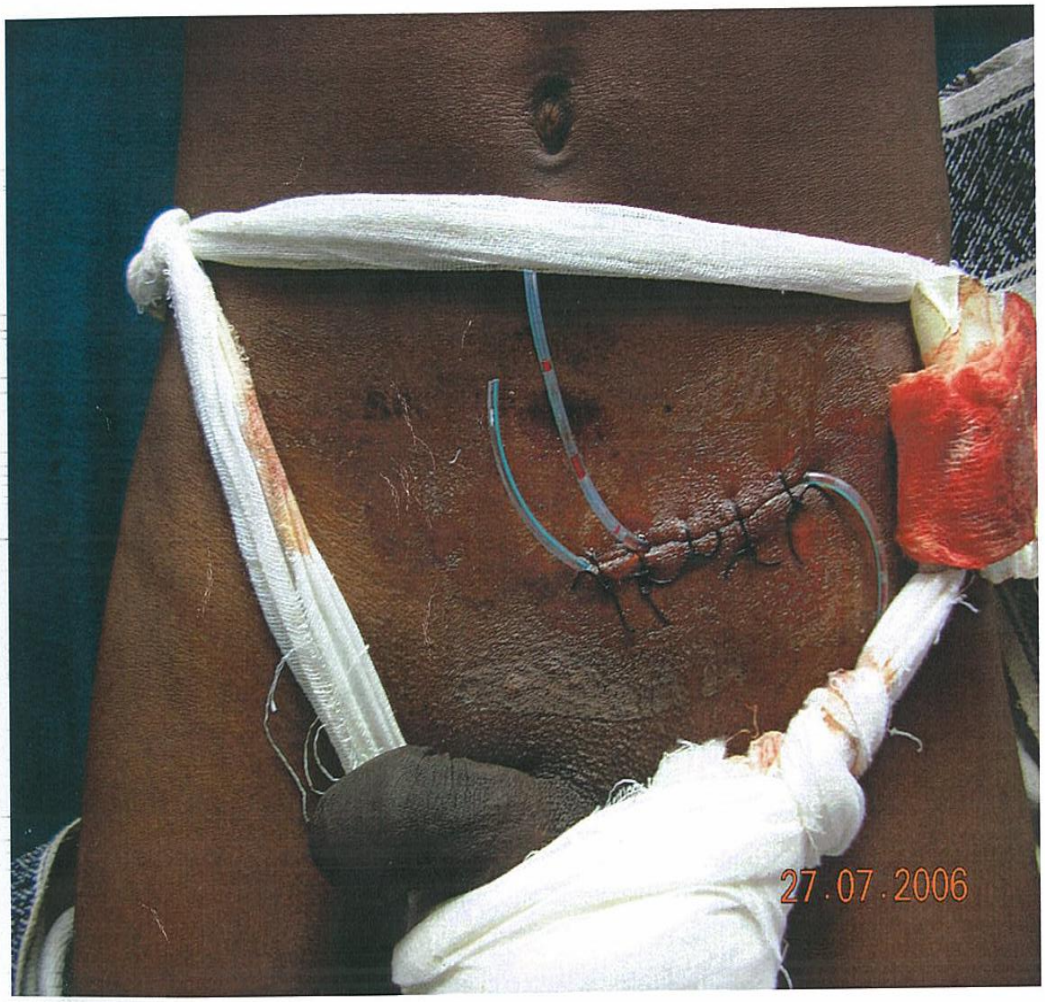
- Age and Sex of the patient do not significantly influence the occurrence of pyrexia in the postoperative period.

- The more the number of preoperative co morbid problems, the more is the complication rate and the delay in recovery from pyrexia.

- Antibiotics have a definitive role to play in preventing infective complications in the postoperative period. Meta analysis show the decreased rate of infections if prophylactic antibiotics are used in the peri-operative period, especially when given around the time of induction.

- The type of surgery (elective or emergency) does not significantly affect the outcome or the occurrence of fever. But complete clinical recovery is more often associated with elective surgery than with an emergency procedure.

POSITIONING AND EFFECTIVE FUNCTIONING OF SEGMULAR DRAIN.



A 25 year old male patient who underwent herniorraphy for a left side indirect inguinal hernia.

The wound on inspection after 48 hours shows the presence of soakage, indicating the effectives of the drains in letting out small collections.

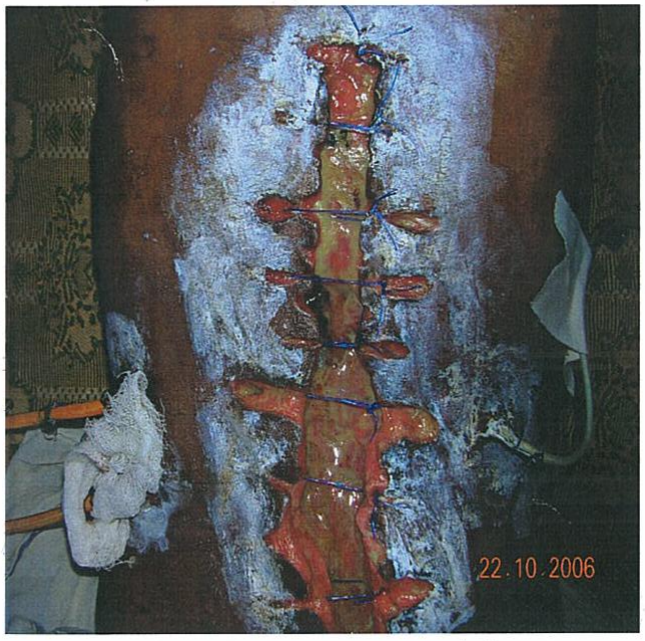
- The type of anaesthesia plays a minor role as an etiology of fever. But different anaesthetic medications, sterility of endotracheal tubes and blood pressure changes (hypotension) during the intra operative period do have a definitive role to play in determining whether a patient will have post operative pyrexia or not.

- The duration of surgery is significantly related to the occurrence of pyrexia. The longer the duration of the surgical procedure, the greater is the tissue damage, bleeding, wound infections and wound complications and higher is the temperature rise in the post operative period.

- The type of pyrexia also significantly affects the outcome of the patient. Patients with continuous type of fever have a poorer prognosis; where as patients with an intermittent or remittent type of fever have complete clinical recovery.

- According to our study segmular drainage tubes help to reduce the incidence of wound complications like hematoma and seroma as well as reducing the incidence of wound infections. The role of the use of segmular drainage tubes is fascinating and needs a further evaluation with a larger subset of patients.

23 year old male with pyrexia due to abdominal wound infection.



A patient with Burst abdomen following abdominal wound infection with pyrexia in the postoperative period.

- Presence or absence of intra operative problems, play a major role in determining the occurrence of post operative pyrexia.

  Intraoperative problems like bleeding, tissue handling, sepsis, difficult dissections also affect the outcome of patient as a whole.

- The etiology of pyrexia, classified according to the day on which the fever appears has been extensively studied. The causes of pyrexia in the first 48 hours, according to our study is tissue damage, and wound complications like seroma and haematoma. Wound infection plays a minor role in the first 48 hours. Other causes of fever include post operative atelectasis and blood transfusion.

- Pyrexia on days 3-5 is most commonly due to wound infections and other site sepsis like, infection of intra venous lines, drip and drain site infections, abscesses and collections (sub phrenic or pelvic). Other causes include bronchopneumonia, phlebitis of superficial veins and blood transfusion.

- Pyrexia on days 6 and 7 in our study was commonly due to wound complications, wound infection and other site infection,

with contributions from other causes like phlebitis, anastomotic leak, gastrointestinal fistulae and malignancy. This is compared to the west where deep vein thrombosis and pulmonary embolism is the commonest cause.

- After first week, the causes were less likely to be directly related to specific operations undertaken. Here the etiologies include wound sepsis, distant site sepsis, phlebitis and blood transfusion.

- The organisms grown vary from hospital to hospital. In our study, E.Coli was the most common organism implicated in the causation of post operative pyrexia. This is compared to the west where Methicillin Resistant Staphylococcus Aureus (MRSA) is emerging as the leading cause of pyrexia.

- Finally, complete recovery is the rule in majority of patients with a minor febrile episode and death occurs more commonly in those with a continuous febrile illness.

Summary

SUMMARY

Pyrexia in the postoperative period is a common occurrence. A wide variety of causes, both infective and non infective are implicated. It is of utmost importance that the surgeon understands the pathophysiology of pyrexia in different etiologies. Evaluation of postoperative pyrexia in the general surgical ward should proceed based on findings elicited from the history and physical examination. Evaluating postoperative fevers with a "shotgun" battery of laboratory and radiological tests is not cost effective and it may yield conflicting results. Pyrexia in the first 48 hours is most often due to non infectious causes related to the surgical trauma itself. Further investigation of an early non sustained fever is usually not warranted if the patient is no longer febrile. Infection per se occurs more commonly between the third and fifth postoperative days. The surgeon should also keep in mind the costs involved in the delay of hospital discharge secondary to postoperative pyrexia. Finally, the role of the duration of surgery and adherence to simple measures of wound management like wound irrigation before closure and placement of segmular drainage tubes in determining the outcome of a patient must be realised. Further studies, about this fascinating aspect of management of surgical wounds is suggested.

Annexure

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Proforma

EVALUATION OF POSTOPERATIVE PYREXIA IN THE GENERAL SURGICAL WARD.

NAME: **IP.NO:** **DOA :** **DOS :** **DOD :**

0-10 YEARS	10-20 YEARS	2 0-30 YEARS	3 0-40 YEARS	4 0-50 YEARS	5 0-60 YEARS	>6 0 YEARS

MALE	FEMALE

AGE

SEX

PREOPERATIVE DIAGNOSIS

PREOPERATIVE CO-MORBIDITIES

DM	HT	OBESITY	IHD	SEPSIS	OTHERS

ANTIBIOTIC PROPHYLAXIS **TYPE OF SURGERY** **TYPE OF ANAESTHESIA**

REGIME 1	REGIME 2	REGIME 3

EMERGENCY	ELECTIVE

GA	SA	EPIDURAL	LA

DURATION OF SURGERY

0-1\2HOUR	1\2-1 HOUR	1-11\2 HRS	11\2-2 HRS	2-21\2 HRS	21\2-3 HRS	3-31\2 HRS	31\2-4 HRS	>4 HRS

SURGICAL PROCEDURE **SEGMULAR DT INTRAOPERATIVE PROBLEMS**

DAY\DEGREE OF PYREXIA

DAY	1	2	3	4	5	6	7	2ND WEEK	3RD WEEK	4TH WEEK
DEGREE										

TYPE OF PYREXIA

INTERMITTENT	REMITTENT	CONTINUOUS

PROBABLE ETIOLOGY OF PYREXIA AND INVESTIGATIONS

SITE	PROBABLE CAUSE		INVESTIGATIONS
WOUND	TISSUE DAMAGE\NECROSIS		
	HEMATOMA		
	SEROMA		
	INFECTION		
RESPIRATORY	URI\LRI		
	ATELECTASIS		
	BRONCHOPNEMONIA		
SEPSIS	IV LINE		
	DRAIN SITE		
	ABSCESS\COLLECTIONS		
	INDWELLING URINARY CATHETER		
	SEPTICEMIA		
VEINS	PHLEBITIS		
	DEEP VEIN THROMBOSIS		
	PULMONARY EMBOLISM		
CVS	MYOCARDIAL INFARCTION		
OTHERS	BLOOD TRANSFUSION		
	ANASTAMOTIC LEAK		
	FISTULOUS COMMUNICATION		
	MESH INFECTION		
	MALIGNANCY		

FINAL DIAGNOSIS

TREATMENT GIVEN **OUTCOME**

MEDICAL	SURGICAL	CONSERVATIVE

COMPLETE RECOVERY	COMPLICATIONS	DEATH

Master Chart

POST OPERATIVE PYREXIA

MASTER CHART

NAME	IP NO.	AGE	SEX	POP 0	POP 1	POP 2	POP 3	POP 4	POP 5	POP 6	AB	TYPE P SURGERY	TYPE OF ANAES	DURATION	SDT	DAY OF PYREXIA D1	D2	D3	D4	D5	D6	D7	DW2	DW3	DW4	DEGREE OF PYREXIA D^0_1	D^0_2	D^0_3	D^0_4	D^0_5	D^0_6	D^0_7	D^0_{W2}	D^0_{W3}	D^0_{W4}	TYPE OF PYREXIA	ETIOLOGY WOUND 1	WOUND 2	WOUND 3	WOUND 4	RESP. 1	RESP. 2	RESP. 3	SEPSIS 1	SEPSIS 2	SEPSIS 3	SEPSIS 4	SEPSIS 5	VEINS 1	VEINS 2	VEINS 3	CVS	OTHERS 1	OTHERS 2	OTHERS 3	OTHERS 4	OTHERS 5	ORGNISM TYPE	TREATMENT	OUTCOME	PREOPERATIVE DIAGNOSIS	SURGICAL PROCEDURE	INTRA OPERATIVE PROBLEMS
Santhosh Kumar	21056	3	1	N	N	N	N	N	N	N	2	1	2	2	2	1	2									101.6	100.4									1	1																							3	1		emerg.appendicctomy	retrogade muscle cutting
Arjunan	22894	3	1	N	N	N	N	N	Y	N	3	1	1	3	2			3	4	5	6							100.6	100.4	100.4	100.6								4				3												2	1	1	psoas abscess	laparotomy & drainage	1.5 litres of pus drained
Bhaskar	17846	2	1	N	N	N	N	N	Y	N	3	1	1	4	2	1	2	3	4	5	6	7	2	3	4	100.6	100.2	101.2	101.4	100.4	100.4	101.0	100.2	100.2	100.8	3	1		4		3	1	2	3	4	5	1			2				1	2	3	duodenal injury	laparostomy + tube duodeuostomy +VG+	peritouitis Hypotension
Kaliappan	21983	7	1	N	N	N	N	Y	N	N	3	2	1	5	2					5	6		2							101.0	100.8		100.8			1					3		3		3		1							3	2	3	CA Stomach	Laparotomy / ST Gastrectomy/GJ/FJ/JJ	Hypotension
Feroz Khan	21080	5	1	N	N	Y	N	N	N	N	3	2	1	3	2	1	2									100.6	100.4									1	1									1									1	1	1	Cholelithaiasis	open cholecystectomy	difficult adherent gall bladder
Maniyan	21075	6	1	N	N	N	N	N	N	N	1	2	2	3	2	1	2	3	4				2			100.4	100.6	100.4	100.8				100.6			1	1	2	4																7	2	1	L hydrocele	L excision of sac	thick sac bleeding
Singaravel	63992	7	1	N	Y	N	N	N	N	N	1	2	1	2	1	1										100.2									1																				1	1	Multiple Sebaceous cysts face/neck	excision BX	Nil
Ravi	21099	5	1	N	Y	N	N	N	N	N	3	2	4	1	1	1	2			5	6					100.4	100.8			100.6	100.6					1			3															7	1	1	Ca penis	dorsal slit/BX	Nil
Mariyappan	23674	7	1	N	Y	Y	Y	N	N	N	1	2	2	3	2	1	2	3								101.0	100.8	100.6								1	1	2									1								2	1	L hydrocele	L subtotal excision of sac	thick sac bleeding
Venkatesan	22008	5	1	N	Y	N	N	N	N	N	3	2	1	5	1	1	2			5						101.8	100.8			100.6						1				2			4									5	1	1	1	Ca Stomach	GJ + FJ	posterior fixity of growth
Chandran	21973	7	1	N	N	N	N	N	Y	Y	1	2	2	3	2			3	4	5			2					101.0	101.4	101.2			101.8			2	1	2	4															1	2	1	L hydrocele	L subtotal excision of sac	large sac Bleeding
Jayaseelan	12340	4	1	N	Y	N	Y	N	N	N	3	2	2	4	2					5	6	7	2							101.0	102.4	101.6	100.4			3			3	4		3	1	2	3	4	5				2			2	2	3	post Appendicectomy Incisional hernia	Mesh repair	Adhesions
Guna	12776	2	1	N	N	N	N	N	Y	N	3	2	1	3	2			3	4									100.4	100.4							1			4															7	1	1	tuberculous sinus	excision of sinus tract	nil
Perumal	16938	6	1	N	N	N	N	N	N	Y	3	2	1	3	2								2	3									100.4	101.4		1			4			2			1								1	1	1	CA Stomach	GJ	fixity of growth
Laxmi Devi	14143	7	2	N	Y	N	N	N	Y	Y	3	2	2	3	2						6	7	2								100.8	100.8	100.6			1			4				4	1								3	2	2	Rawarca R thigh	ssg	Nil
Saraswathy	16140	3	2	N	N	N	N	N	Y	N	1	2	1	2	2	1	2									100.1	100.4									1			3						1								1	1	antibioma L breast	excision biopsy	nil
Perumal	16938	6	1	N	N	N	N	N	N	N	1	2	2	3	2			3	4	5								101.0	101.2	100.4						1			3	4	1												3	2	1	L hydrocele	L eversion of sac	Nil
Ramji	27047	5	1	N	N	N	N	N	N	N	1	2	2	4	2	1	2	3								100.8	100.6	100.6								1	1		3															1	1	RDIH + L Hydrocele +	Mesh plasty + eversion of sac + circumscission	Nil
Ellammal	28004	5	2	N	N	Y	Y	N	N	N	1	2	1	2	1	1										100.4										1																	1	1	Fibroadenoma L breast	Excision BX	Nil
Soorya	29707	2	1	N	N	N	N	N	N	N	2	1	1	2	2			3	4				2					101.0	100.4				100.8			1						3										1	2	1	Acute appendicitis	emergency Appendi cectomy	Nil
Banumathi	36412	2	2	N	N	N	N	N	N	N	2	2	1	3	2		2										100.6									1																			1	1	Subactue appendicitis	Elective Appendicectomy	Nil
Kurshida	36060	5	2	N	N	Y	Y	N	N	N	3	2	1	4	2		2	3			6	7					100.8	100.6			100.4	100.8				1			3						1								1	1	Cholelithaiasis	open cholecystectomy	Tissue handling
Rajendran	36374	4	1	N	N	N	Y	N	N	N	2	2	2	2	2	1	2	3								101.4	101.4	100.4								1			3															1	1	Subacute appendicitis	Elective Appendicectomy	Nil
Gulsam Bee	35206	5	2	N	Y	Y	Y	N	N	N	3	2	1	4	2	1	2				6	7				100.1	100.4				101.0	100.8				1			3					1								1	1	Cholelithaiasis	open cholecystectomy	Excess tissue handling
Anandu	26379	3	1	N	N	N	N	N	N	N	1	2	2	3	2				4	5		7							100.4	101.0		100.6				1			3	4													1	1	1	RIIH	R Herniorraphy	Nil
Saraswathy	35589	5	2	N	N	N	Y	N	N	N	1	2	4	2	1	1										101.2										1																	1	1	lipoma back	excision BX	Nil
Kannan	36729	4	1	N	Y	Y	Y	Y	Y	N	3	1	1	4	2	1	2	3	4	5	6	7				101.0	101.4	102.0	102.6	101.4	101.0	100.8				3			4	2				1							5	1	1	3	CA Rectum with intestinal	Laparotomy + Endocolostomy	loaded bowls loops, faccal spillage
Srinivasan	38298	3	1	N	N	N	N	N	Y	Y	3	1	1	4	2			3	4	5			2					100.8	100.6	101.0			101.2			1			4														1	2	1	sigmoid volvulus	laparatomy + hartman's procedure	minimal perioneal contamination

SL. NO.	NAME	IP NO.	AGE	SEX	POP 0	POP 1	POP 2	POP 3	POP 4	POP 5	POP 6	AB	TYPE F SURGERY	TYPE OF ANAES	DURATION	SDT
29	Gopi	37292	4	1	N	N	N	N	N	Y	N	2	1	1	3	2
30	Kanniyammal	37278	5	2	N	Y	N	Y	N	N	N	3	2	1	6	2
31	Saranraj	38288	2	1	N	N	N	N	N	Y	N	3	1	1	4	
32	Padmavathy	30442	6	2	N	N	Y	Y	Y	N	N	3	2	1	5	2
33	Kameerunisha	28822	5	2	N	N	N	N	N	N	Y	1	2	1	5	2
34	Mallika	30441	6	2	N	N	N	N	N	N	N	1	2	1	2	2
35	Swarnam	28832	4	2	N	N	N	Y	N	N	N	3	2	3	5	2
36	Ananda Deepam	27057	4	2	N	N	N	N	N	N	N	3	2	1	7	2
37	Kuppammal	26232	7	2	N	Y	Y	N	N	N	N	3	2	1	6	2
38	Nalini	27103	3	2	N	N	N	N	N	N	N	1	2	1	2	1
39	Kumari	26229	6	2	N	Y	Y	Y	N	N	N	3	2	1	5	2
40	Rabiya	24552	3	2	N	N	N	Y	N	N	N	3	2	3	5	2
1	Sheeba	24575	2	2	N	N	N	N	N	N	N	1	2	1	5	2
2	Saradha	21985	6	2	N	N	Y	Y	N	N	N	3	2	1	5	2
3	Hylin Pramila	22829	5	2	N	N	N	Y	N	N	N	3	2	1	6	2
4	Chitra	17745	2	2	N	N	N	N	N	N	N	2	1	2	3	1
5	V.Sumathi	16675	3	2	N	N	N	N	N	N	N	2	2	2	2	2
6	Inbavalli	67455	4	2	N	Y	N	N	N	N	N	1	2	2	3	2
7	Tansi	12799	3	2	N	N	N	Y	N	N	N	3	2	2	4	2
8	Madhumani	11101	4	2	N	N	N	N	N	N	N	1	2	1	2	2
9	Navaneetham	10256	4	2	N	N	N	N	N	N	N	1	2	1	2	1
0	Selvi	9070	5	2	N	N	N	N	N	N	N	1	2	1	5	2
1	Neelavathy	8612	7	2	N	Y	N	Y	N	N	N	3	2	1	6	2
2	Ramayee	288	5	2	N	N	N	N	N	Y	Y	3	2	1	4	2
[illegible]	Jayalaxmi	92342	3	2	N	N	N	N	N	Y	N	3	2	2	3	2
[illegible]	Lalitha	4365	4	2	N	N	N	N	N	N	Y	1	2	4	1	2
[illegible]	Chandra	3135	7	2	N	Y	Y	N	N	N	N	2	1	1	4	2
[illegible]	Parvathy	5462	6	2	N	N	N	Y	N	N	N	3	2	2	4	1

SL. NO.	NAME	DAY OF PYREXIA D1	D2	D3	D4	D5	D6	D7	DW2	DW3	DW4	DEGREE OF PYREXIA D°1	D°2	D°3	D°4	D°5	D°6	D°7	D°W2	D°W3	D°W4	TYPE OF PYREXIA
29	Gopi					5	6	7	2							100.8	100.8	101.0	100.6			1
30	Kanniyammal	1	2	3	4	5	6		2			101.0	100.8	100.6	100.0	100.4	99.6		100.8			1
31	Saranraj	1	2	3	4	5	6	7	2	3		102.0	102.4	101.8	101.6	102.0	101.4	-100.0	101.4	102.0		3
32	Padmavathy							7	2									101.4	101.0			1
33	Kameerunisha	1	2		4							100.4	100.4		101.6							1
34	Mallika	1	2									101.2	100.4									1
35	Swarnam					5	6	7	2							100.4	101.0	101.0	100.4			1
36	Ananda Deepam	1	2					7				101.0	100.4					100.4	100.8			1
37	Kuppammal							7	2									100.4	100.6			1
38	Nalini	1										101.2										1
39	Kumari	1	2					7	2			100.4	100.6					100.4	101.0			1
40	Rabiya							7	2									100.4	101.6			1
1	Sheeba						6	7	2								101.0	100.4	101.4			2
2	Saradha	1	2									100.4	101.6									1
3	Hylin Pramila	1	2	3								101.0	101.2	100.4								1
4	Chitra	1										101.0										1
5	V.Sumathi	1	2									100.4	100.4									1
6	Inbavalli	1			4							100.8			100.4							1
7	Tansi				4	5		7	2						101.0	100.0		100.4	101.0			1
8	Madhumani	1										100.8										1
9	Navaneetham	1										101.2										1
0	Selvi	1	2									100.0	101.4									1
1	Neelavathy	1	2	3								100.2	101.0	100.6								1
2	Ramayee			3	4									101.0	100.4							1
[illegible]	Jayalaxmi				4	5		7							101.6	101.8		100.4				1
[illegible]	Lalitha		2	3									100.4	101.2								1
[illegible]	Chandra	1	2	3				7	2			101.0	101.4	100.4				101.4	100.4			1
[illegible]	Parvathy	1										100.8										1

SL. NO.	NAME	ETIOLOGY: WOUND 1	WOUND 2	WOUND 3	WOUND 4	RESP. 1	RESP. 2	RESP. 3	SEPSIS 1	SEPSIS 2	SEPSIS 3	SEPSIS 4	SEPSIS 5	VEINS 1	VEINS 2	VEINS 3	CVS	OTHERS 1	OTHERS 2	OTHERS 3	OTHERS 4	OTHERS 5	ORGNISM TYPE	TREATMENT	OUTCOME	PREOPERATIVE DIAGNOSIS	SURGICAL PROCEDURE	INTRA OPERATIVE PROBLEMS
29	Gopi				4																		1	2	1	blunt injury abdome hollow viscus	laparotomy + primary closure	peritonitis locaused
30	Kanniyammal	1		3	4													1					4	2	1	papillyar CA thyroid	total thyroidectomy	tracheal handling, dense adhesions, Bleeding
31	Saranraj	1			4				1			4	5	1				1					4	2	3	RTA/Crush injury R Arm +	guillotine amputation + wound debridement	heavily contaminated wound
32	Padmavathy			3	4									1								5	6	1	2	recurrent R Ca breast	excision I SSG	infiltration INO PEC major
33	Kameerunisha	1			4									1									1	1	1	papillary CA thyroid completion	completion thyroidectomy	
34	Mallika	1		3																				1	1	L breast fibroadenoma	excision BX	Nil
35	Swarnam	1		3	4																		4	2	1	incisional hernia	mesh repair	fatty abdomen thin upper central flap
36	Ananda Deepam	1		3	4																		4	1	1	CA Breast	MRM I LD flap	Tissue handling
37	Kuppammal	1		3																				1	1	L CA Breast	MRM L	diathermy burns
38	Nalini																							1	1	fibroadenoma R breast	excision BX	Nil
39	Kumari	1		3	4																		1	2	1	phylloides tumour L breast	excision BX	bleeding adhesions
40	Rabiya	1		3	4																		1	2	1	incisional hernia	Mesh repair	Tissue handling central unhealthy flap
1	Sheeba										3												7	2	1	L parutid tumour	L superficial parotidectomy	Nil
2	Saradha			3																				1	1	Cholelithaiasis	open cholecystectomy	difficult gb
3	Hylin Pramila	1		3										1				1						1	1	pelvic mass (fibroid uterus)	Hysterectomy	bleeding
4	Chitra																							1	1	Acute appendicitis	emergency Appendi cectomy	Nil
5	V.Sumathi																							1	1	grade II hamorrhoids	open hamerrhoidectomy	Nil
6	Inbavalli				4																		1	1	1	vuival wails	excision BX	Nil
7	Tansi			3	4																4		1	2	1	incisional hernia	Mesh repair	Nil
8	Madhumani																							1	1	fibroadenoma R breast	excision BX	Nil
9	Navaneetham																							1	1	fibroadenoma R breast	excision BX	Nil
0	Selvi	1																						1	1	L CA Breast	MRM	tissue handling
1	Neelavathy	1		3										1				1						1	1	L CA Breast	MRM	bleeding
2	Ramayee																	1				5		1	1	CA Stomach	AGJ	inoperable tumour
[illegible]	Jayalaxmi				4																		6			raw area L foot	SSG	Nil
[illegible]	Lalitha					1																	7	1	1	cervical lymphadenopathy	excision BX	Nil
[illegible]	Chandra				4									1									1	1	1	acute cholecystitis	open cholecystectomy	gangrenous GB
[illegible]	Parvathy																							1	1	paraumblical hernia	Mesh repair	Nil

SL. NO.	NAME	IP NO.	AGE	SEX	POP 0	POP 1	POP 2	POP 3	POP 4	POP 5	POP 6	AB	TYPE F SURGERY	TYPE OF ANAES	DURATION	SDT	DAY OF PYREXIA D1	D2	D3	D4	D5	D6	D7	DW2	DW3	DW4	DEGREE OF PYREXIA D°1	D°2	D°3	D°4	D°5	D°6	D°7	D°W2	D°W3	D°W4
57	Maheswari	3151	3	2	N	N	N	Y	N	N	N	3	2	3	6	2						6	7									101.6	100.4			
58	Puspa	43729	5	2	N	Y	Y	Y	N	N	N	3	2	1	5	1			3										101.4							
59	Venu Raman	10279	6	1	N	Y	N	N	N	N	N	3	2	1	5	2	1			4	5						101.4			102.0	102.4					
60	Ganesh	11412	6	1	N	Y		Y	N	N	N	1	2	2	3	1	1										100.8									
61	Raja	1283	3	1	N	N	N	N	N	N	N	1	2	2	2	1	1	2									101.4	100.6								
62	Narayanan	10252	6	1	N	Y	N	Y	N	N	N	3	2	2	5	1	1	2									101.4	100.6								
63	Leelavathi	8612	4	2	N	Y	N	Y	N	N	N	3	2	1	5	2	1	2			5	6					101.6	102.0			102.4	101.4				
64	Rajendran	12884	4	1	N	N	N	N	N	N	N	1	2	2	3	2	1	2		4	5		7				102.4	101.6		101.4	101.4		101.6			
65	Venkatesan	14114	2	1	N	N	N	N	N	N	N	1	2	1	5	2	1	2									101.0	101.4								
66	Edwin	36467	2	1	N	N	N	N	N	N	N	2	1	2	3	1	1										101.6									
67	Arunkumar	36462	2	1	N	N	N	N	N	N	N	2	1	2	3	1	1	2									102.4	101.6								
68	Prakash	35174	4	1	N	N	N	N	N	N	N	1	2	2	4	1	1	2									101.8	101.4								
69	Sarathy	34286	6	1	N	Y	Y	N	N	N	N	1	2	2	4	2				4	5	6	7							102.6	102.4	101.4	101.6			
70	Selvam	33866	5	1	N	N	N	N	N	N	N	2	1	2	3	1	1	2									102.6	101.4								
71	Velayutham	32990	5	1	N	N	N	Y	N	N	N	2	1	2	3	1	1	2									101.4	101.4								
72	Somasundaram	32987	5	1	N	N	N	N	N	Y	N	3	1	1	3	1	1	2	3	4							103.2	102.4	101.6	101.4						
73	Ganesan	32097	2	1	N	N	N	N	N	N	N	3	1	1	3	1	1	2									101.6	101.4								
74	Premkumar	33207	3	1	N	N	N	N	N	N	N	2	1	2	2	1	1										101.6									
75	Sudhakar	32738	3	1	N	Y	N	N	N	Y	N	1	2	1	4	2	1				5	6					101.6				102.4	101.4				
76	Malakondiya	389	5	1	N	Y	N	N	N	Y	Y	3	2	1	1	2	1	2	3	4	5	6	7	2			103.6	102.4	102.4	101.6	102.6	102.4	101.6	101.4		
77	Raju	57261	3	1	N	N	N	N	N	Y	N	2	1	1	4	2	1	2	3		5	6		2			102.4	102.6	101.8		101.8	101.4		101.4		
78	Ayub	25571	4	1	N	N	N	N	N	Y	N	3	2	1	4	2	1	2			5		7				101.4	101.6			101.6		101.4			
79	Nithyanandan	9342	3	1	N	N	N	N	N	N	N	1	2	2	3	1	1										101.4									
80	Krishnan	9396	4	1	N	N	N	N	N	Y	N	1	2	2	2	1	1			4	5		7	2			102.4			101.6	102.4		101.6	101.8		
81	Deen	1879	5	1	N	Y	N	Y	Y	N	N	3	2	2	5	1	1			4							101.8			101.4						
82	Panchatcharam	7849	4	1	N	N	N	N	N	N	N	1	2	2	3	2	1										101.4									
83	Kumar	3060	3	1	N	N	N	N	N	N	N	1	2	2	3	2	1					6	7	2			101.6					102.4	102.4	101.6		
84	Krishnamurthy	10250	5	1	N	Y	N	N	N	N	N	1	2	2	3	2	1										101.4									

SL. NO.	TYPE OF PYREXIA	ETIOLOGY WOUND 1	WOUND 2	WOUND 3	WOUND 4	RESP. 1	RESP. 2	RESP. 3	SEPSIS 1	SEPSIS 2	SEPSIS 3	SEPSIS 4	SEPSIS 5	VEINS 1	VEINS 2	VEINS 3	CVS	OTHERS 1	OTHERS 2	OTHERS 3	OTHERS 4	OTHERS 5	ORGNISM TYPE	TREATMENT	OUTCOME	PREOPERATIVE DIAGNOSIS	SURGICAL PROCEDURE	INTRA OPERATIVE PROBLEMS
57	1			3	4																		3	1	1	post LSCS incisional hernis + tubectomy	Mesh repair + tubectomy	fatty abdomen
58	1																							1	1	Cholelithaiasis	open cholecystectomy	Nil
59	1	1		3								4											1	1	1	Ca penis	total amputation of penis and perinal	bleeding
60	1																							1	1	RIIH	R Herniorraphy	Nil
61	1																							1	1	LIIH	L Herniorraphy	Nil
62	1																							1	1	B/L direct inguinal hernia	mesh repair	tissue handling
63	1			3	4									1				1					2	2	1	CA Breast	MRM	tissue handling bleeding
64	1		2		4																		1	2	1	R Hydrocele	R excision of sac	thick calcified sac
65	1																							1	1	small bowel lymphoma	resection and anastamosis	tissue handling
66	1																							1	1	Acute appendicitis	emergency Appendi cectomy	Nil
67	1																							1	1	Acute appendicitis	emergency Appendi cectomy	Nil
68	1																							1	1	RIIH	R Herniorraphy	Nil
69	1		2	3																				2	1	RIIH	R Herniorraphy	Nil
70	1																							1	1	Acute appendicitis	emergency Appendi cectomy	Gangrene appendix
71	1																							1	1	Acute appendicitis	emergency Appendi cectomy	fatty abdomen
72	1													1										1	1	DU perforation	laparatomy patch closure	peritonitis
73	1																							1	1	DU perforation	laparatomy patch closure	peritonitis
74	1																							1	1	Acute appendicitis	emergency Appendi cectomy	Nil
75	1				4																		5	1	2	hydraadenitis suppurativa (axilla)	excision with SSG	Nil
76	3				4						3									3			4	2	2	parietal wall abscess	I / D	Nil
77	1				4									1									1	2	1	ileal perforation	laparotomy tube ileostomy	peritonitis
78	1				4																		2	1	1	bedsore	gluteal flap cover	Nil
79	1																							1	1	RIIH	R Herniorraphy	Nil
80	1				4																		2	1	1	FB right thigh	exploration + FB removal	intramuscular abscess
81	1			3																				1	1	Bilateral DIH	Bilateral mesh repair	tissue handling
82	1																							1	1	L hydrocele	L eversion of sac	Nil
83	1	1	2	3	4									1									3	2	1	L hydrocele	L excision of sac	tissue handling & bleeding
84	1																							1	1	L hydrocele	L eversion of sac	Nil

S.	NAME	IP NO.	AGE	SEX	POP							AB	TYPE F SURGERY	TYPE OF ANAES	DURATION	SOT	DAY OF PYREXIA										DEGREE OF PYREXIA										TYPE OF PYREXIA	ETIOLOGY													ORGNISM TYPE	TREATMENT	OUTCOME	PREOPERATIVE DIAGNOSIS	SURGICAL PROCEDURE	INTRA OPERATIVE PROBLEMS
					0	1	2	3	4	5	6						D1	D2	D3	D4	D5	D6	D7	D^W2	D^W3	D^W4	D^0 1	D^0 2	D^0 3	D^0 4	D^0 5	D^0 6	D^0 7	D^0 W2	D^0 W3	D^0 W4		WOUND			RESP.			SEPSIS				VEINS			CVS	OTHERS									
																																					1	2	3	4	1	2	3	1	2	3	4	5	1	2	3		1	2	3	4	5						
5	Shanmugam	15310	2	1	N	N	N	N	N	N	N	2	1	2	3	2	1	2		4			7	2			101.6	102.4		101.4			101.4	101.6			1			4			2									2	2	1	Acute appendicitis	emergency Appendi cectomy	appendicular abscess
6	Mano	11115	2	1	N	N	N	N	N	N	N	2	1	2	2	1	1										102.4									1															1	1	Acute appendicitis	emergency Appendi cectomy	Nil
7	Bagyaraj	15320	3	1	N	N	N	N	N	N	Y	1	2	4	1	2	1	2			5						101.4	101.6			101.6						1			4												6	1	1	congenital lymphedema	excision biopsy	lymphorrhoea
8	Sagadevan	41310	7	1	N	N	Y	N	N	N	N	3	2	1	6	2	1	2									101.4	101.6									1									1		1				1	1	STS L thigh	compartmental excision	tissue handling bleeding
9	Sampath	20078	3	1	N	N	N	N	N	N	Y	1	2	1	5	1		2	3									101.4	101.6							1															1	1	chronic da with GOO	laparatomy TV + GJ	Nil
0	Pindo	22348	2	1	N	N	N	N	N	N	N	1	2	1	2	1	1										101.6									1															1	1	dermoid cyst	excision biopsy	Nil
1	Jagadeesan	24011	5	1	N	N	N	N	N	N	N	1	2	2	3	1	1			4							101.4			100.4							1															1	1	L hydrocele	L excision of sac	Nil
2	Venkatesan	24210	4	1	N	N	N	N	N	N	N	2	1	2	3	1		2										101.6									1															1	1	Acute appendicitis	emergency Appendi cectomy	Nil
3	Panchavarnam	24119	4	2	N	N	N	Y	N	N	N	2	2	2	3	2	1	2									101.6	101.8									1															1	1	II Piles with fissure	open hamerrhoidectomy + lateral sphincterotomy	Nil
4	Shanmugam	24410	7	1	N	Y	N	N	N	N	N	3	2	2	4	1	1	2		4							102.4	102.4		101.6							1															1	1	RDIH	R mesh repair	Nil
5	Anusooya	24010	5	2	N	Y	N	N	N	N	N	3	2	2	4	1	1	2	3								102.0	101.8	102.0								1		3													1	1	recurrent RIH	R mesh repair	adhesions & tissue handling
6	Vembuli	23142	5	1	N	Y	N	N	N	Y	N	3	2	2	4	2					5		7	2							101.6		101.6	100.4			1			4											3	1	1	raw area L foot	SSG	Nil
7	Vijaya	24493	5	2	N	N	Y	N	Y	N	N	3	2	1	7	1	1	2	3	4	-	6	7				103.6	101.4	102.8	101.6		101.6	102.0				3	1					4	1		1	1					1	3	Cholelithiasis + fibroid uterus	open cholecystectomy + hysterectomy	bleeding, tissue handling, hypotension, difficult dissection
8	Saraswathy	24418	6	2	N	Y	N	N	N	N	N	1	2	1	2	2	1										100.4									1															1	1	BCC face	excision biopsy	Nil
9	Annakili	24142	6	2	N	N	Y	N	N	N	N	1	2	1	1	2	1										100.4									1															1	1	squamous papilloma tongue	excision biopsy	Nil
0	Immanuel	24218	2	1	N	N	N	N	N	N	N	2	1	2	3	1	1	2									100.6	101.4									1															1	1	Acute appendicitis	emrgency appendicectomy	gangrine appendix
1	Murthy	23404	4	1	N	N	N	N	N	N	N	1	2	2	4	1					5	6									102.0	101.6					1							1									1	1	B/L Hydrocele	B/L eversion of sac	Nil
2	Sabrina	24335	4	2	N	N	N	N	N	Y	N	2	1	1	4	2	1	2			5						102.4	101.6			101.4						1			4												1	2	1	Acute appendicitis	emregency appendicectomy	gangrine / perforated appendix
3	Munusamy	20705	7	1	N	Y	Y	Y	N	N	N	3	1	1	4	2	1	2	3	4	5			2			101.4	101.8	102.0	102.2	101.4			100.6			2			4					4			1			5	1	1	2	gastric perforation	laparetomy + perforation closure	peritonitis
4	Chinnadurai	18806	7	1	N	N	N	N	N	N	N	1	2	2	3	1	1										100.4									1														5		1	1	L testicular tumour	L high orchidectomy	Nil
5	Kaliammal	19723	4	2	N	N	N	Y	N	N	N	3	2	1	6	2						6	7	2								101.8	101.4	101.0			1	1			4								1			3	2	2	L CA Breast	MRM	diathermy burns
6	Rukmani	19725	3	2	N	N	N	N	N	N	N	1	2	1	2	1		2										101.4									1															1	1	R Breast fibrodenoma	excision biopsy	Nil
7	Srinivasan	21583	4	1	N	N	N	N	N	N	N	2	1	2	3	2		2										101.0									1															1	1	Acute appendicitis	emergency Appendi cectomy	Nil
8	Perumal	14667	6	1	N	Y	N	Y	N	N	N	1	2	2	4	2		2	3									101.0	101.2								1		3													1	1	Bilateral Hydrocele	Bilateral excision of sac	thick sac & tissue handling
9	Desapattu	21570	5	2	N	Y	Y	Y	N	N	N	3	2	3	6	2	1		3	4			7	2			102.0		101.4	101.0			102.0	101.6			1			3	4				1					1	2	1	incisional hernia	mesh repair	fatty abdomen
0	Shariff	21256	5	1	N	N	N	N	N	N	N	1	2	2	2	1	1										101.4									1															1	1	Acute appendicitis	emergency Appendi cectomy	Nil

POP O - 6	:	Pre Operative Comorbidity; Nil (0), DM(1), HT (2), Obesity (3), IHD (4), Sepsis (5), Others (6)
D	:	Day
W	:	Week
Wound 1-4	:	Tissue Damage / Necrosis (1), Hematoma (2), Seroma (3), Infection (4)
Resp 1-3	:	Respiratory Cause : URI/LRI(1) Atelectasis (2), Bronchopnemonia (3)
Sepsis 1-5	:	IV Line (1), Drain Site (2), Abscess/Collection (3), Catheter (4), Septicemia (5)
Veins 1-3	:	Phlebitis (1), DVT (2), PE (3)
CVS	:	MI
Others 1-5	:	Blood Transfusion (1), Anastamotic Leak (2), Fistulous Communication (3), Mesh Infection (4), Malignancy (5)
Organism 1-7	:	E.coli (1), Klebsiella (2), Proteus (3), Pseudomonas (4), Streptococcus (5), Staphylococcus (6), No growth (7)